

# Diseases of Children

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# The Osteopathic Treatment *of* Children's Diseases

*Produced by*  
THE EDUCATION DEPARTMENT  
With a Large Corps of Writers  
and Contributors

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EDITED BY  
IRA W. DREW, D. O.

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LOS ANGELES, CALIFORNIA

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## PUBLISHER'S ANNOUNCEMENT

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✓  
This book is the second of a series being prepared under the auspices of the Educational Department of the A. T. Still Research Institute. The first, "Clinical Osteopathy" has been received most cordially, and has given useful service.

The material for these volumes is being gathered from many sources, including osteopathic publications, reports of lectures, college clinics, and reports from several hundred osteopathic practitioners who have been especially interested in the care of children. The teachers of Pediatrics in each of the osteopathic colleges have made noteworthy contributions and are giving cordial help in the preparation of this volume. To all of these the gratitude of the profession is due, for they have given hard work for the sake of providing good osteopathic books.

Publication Bureau,  
THE A. T. STILL RESEARCH INSTITUTE.

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## PART I. THE NEWLY BORN

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### CHAPTER I

#### OSTEOPATHIC EXAMINATION OF THE NEW-BORN CHILD

(L. M. Whiting, D. O.)

The osteopathic examination differs from that made by ordinary obstetricians only in its greater attention, and in the more careful examination of the framework of the body. The obstetrician usually makes the first examination, and usually cares for the baby during the mother's convalescence. Technically, the work of the pediatrician begins with the baby's birth, and any lack of skill in the care of the baby during its first days of independent life increase the dangers of its years of infancy and childhood. The responsibility for the occurrence of several serious abnormalities of later life rests with the ignorant or careless midwife or physician who neglects this first and important examination of the new-born child.

The baby should cry vigorously at once, after birth. The skin should be rosy or slightly mottled. The body may be partially covered with vernix caseosa, which is removed by the first bath. The position which was normal in the uterus persists for a time after birth. The head may appear deformed, as a result of pressure conditions during labor and birth.

The baby should be examined as soon as is practicable after it is born. Attention at this time may prevent very serious complications at a later time. This is especially the case when labor has been long, or when version or forceps delivery of breech presentation or other usual conditions have caused or have permitted undue pressure or tension to affect the body of the baby. The following order of procedure is good.

1. Place the baby upon a warm blanket, upon a level table. Some source of warmth should keep the air very warm; an electric stove or several electric light bulbs or hot water bottles upon the table are very good. The room should be warm and no drafts permitted during the examination. Too great heat should be avoided. If the baby is kept very warm there need be no haste, and the examination can be made carefully.

2. **Measure** the head in all dimensions, and measure the thorax, using calipers or tapeline. The following measurements are approximately correct for both sexes, when at full term.

Diameters:—

Bitemporal	7-8 centimeters
Biparietal	9-9¼ centimeters
Occipito-frontal	12 centimeters (=bisacromial)
Occipito-mental	13-14 centimeters
Suboccipito-frontal	10 centimeters
Suboccipito-bregmatic	9 centimeters
Bisacromial	12 centimeters (= occipito-frontal diameter)

Circumferences:—

Occipito-frontal 34-35 centimeters (=chest circumference)

Suboccipito-frontal 32 centimeters

Thorax 34-35 centimeters (=occipito-frontal circumference)

(Dunn, Griffith, give circumference of thorax 31 cm. and circumference of head 33 cm.)

The length of the child, with legs extended comfortably, should be about 49 cm. in girls and about 51 cm. for boys. This varies to greater extent than do other measurements.

3. **The framework** of the body should next be examined, and this is very important; it must be carefully done, not only that minute variations from the normal may be recognized, but also that no harm be given by hasty handling. The spinal column is very flexible, in the normal child, and shows no curvatures except the one long curve due to the intrauterine position. The neck seems very short and thick; it is also very flexible. The head should turn 110° to both right and left; and this should be equal on both sides. If any undue traction had been made during birth, or if forceps had been used, or if version had been performed, or if the presentation had been breech, neck lesions would be very apt to occur. Even during normal labor and birth, lesions may be caused by pressure upon the rotating head, especially if the obstetrician has the vicious practice of using traction on the neck to facilitate the delivery of the shoulders.

It is true that ossification is only partially completed, and that the vertebrae and other bones of the body are very soft; yet these bones are subject to practically the same subluxations as those to which adult bones are subject. In immature bones, further growth perpetuates the abnormal condition, while in the adult the bony form is less appreciably altered.

The ribs are nearly horizontal, and are not often subject to lesions.

The hands and arms should be examined for deformities, for separation of the epiphyses, and for subluxations, especially of the shoulder. The clavicle and scapulae should be noted, especially with reference to any pressure upon the brachial plexus. Correction of lesions of the clavicle and neighboring structures may prevent Erb's palsy, one of the most pathetic of birth injuries. The movement of the thorax in breathing can be watched at this time, and the breath sounds noted. In the new-born baby the breathing is rougher even than in the child, and sounds resembling rales may be noted.

The hips and legs should next be examined. The innomines should be equally spaced with regard to the sacrum and the sternum. The trochanters should be very carefully examined. Congenital dislocation of the hip is only serious when permitted to remain unrecognized. If corrected at this time, no harm results. The legs should be examined for deformities, and for separation of epiphyses. The feet should be examined for abnormalities of position or of structure. The normal baby's foot appears flat; this is due to a pad of fat under the arch of the foot. Abnormalities of position or structure; club-foot, and other peculiarities may be easily corrected if the condition is recognized at this time.

4. **The orifices** of the body next receive attention. With sterile finger the palate and tongue may be palpated. The tongue should be raised easily. If the frenulum is too long, it may be very slightly clipped with blunt-pointed scissors. Only slight cutting is enough, usually, while too deep an incision may result in severe, or even fatal, hemorrhage. If the incision is not deep enough, another cut may be made later. The ears should be equally placed, and of the same size and shape. They should not be adherent to the scalp.

5. **The eyes** should be almost or quite closed. (The obstetrician has already dropped an aseptic or antiseptic solution into the eyes, immediately after birth. 1% silver nitrate, or 5% protargol, or 20% argyrol, are the solutions most commonly employed for this purpose. If this has not been done before the examination of the baby, it may be done at this time. The purpose of this procedure is to prevent infection of the baby's eyes by bacteria reaching them during birth.)

6. **The breasts** may contain milk, whether the baby is a boy or girl. The girl baby may have a bloody vaginal discharge, resembling menstruation. These conditions appear to be due to hormones or internal secretions in the maternal blood, and there is nothing to be done about them; no harm results from either condition, unless unwise manipulations are employed.

7. The anus and lower rectum, the urethra, the penis, the scrotum and the hymen should receive attention next. Imperforate anus, or urethra, or hymen are easily remedied by very simple surgical



methods if the work is done before infection of the intestinal tract occurs.

The foreskin should slip easily over the glans. A certain amount of tension can be relieved by manipulation, but circumcision is the rational procedure if the irritation is pronounced. Both testicles should be in the scrotum.

8. **Weight.** After the baby has been thoroughly examined and any malformations noted, he should be weighed and then dressed. The weight and all other findings should be recorded. The average boy weighs 3400 grams, or about 7 pounds. The girl usually weighs about 3300 grams, or about 6¾ pounds. There is greater variation in the weight than in the length of babies at term.

Immediate attention should be given to such conditions as require surgical treatment. Babies endure surgical measures remarkably well, suffer, apparently, very little, and their tissues heal and develop into normal tissues. On the other hand, if such conditions remain unrecognized until the nurse calls attention to the fact that the baby has voided neither urine nor feces, though she may have administered almost fatal doses of "home remedies" to stimulate bowel and kidney action, the prognosis is complicated by infection, drugs, and other factors dependent upon these.

Before the baby's birth the mother and the nurse should have been taught how to bathe and dress the baby; how to have the clothing light and yet warm and easily put on and off; the dangers of tight bands, and of rough garments, and of too great weight of clothing, and of covering the face, and of the other dangerous and harmful procedures, both mother and nurse should understand clearly.

**Care of the Umbilical Cord.** After the cord has ceased pulsating, probably about five minutes after the baby has been born, a ligature of soft sterile silk cord is tied around it, about 3.5 to 4 c.m. from the umbilicus. The cord is then cut beyond the ligature. The end is dried with sterile cotton, thickly powdered with bismuth, or boric acid or a mixture of salicylic acid, boric acid, zinc oxide and starch, or other soft powder, then wrapped in soft gauze, lint or cotton filled with the same powder, and a binder placed around the abdomen to hold the dressing in place. Another method sometimes employed is to wet the end of the cord abundantly with absolute alcohol, then dress with dry gauze, held in place by the usual binder. It must be urgently insisted that this binder be not tightly applied; if it holds the dressing firmly, that is all that is needed. The old idea that the binder gives strength to the abdominal muscles, or that it prevents hernia, is unfounded. The binder should be wide enough to remain in place without being tight; it should not cause the flesh to bulge above or below its edge. Unless there is some reason to suspect infection or hemorrhage, or the dressings become

wet or soiled, they should not be removed from the stump of the cord. The stump, with the dressings, usually falls off about the fifth day, leaving a small, healthy-looking ulcer; this soon heals over. If any small unhealthy-looking granulations are present, a very tiny cautery of silver nitrate may be used.

**Bathing and Dressing.** After the cord has received attention, the baby should be laid upon a warm blanket in a well-padded basket to rest until the bath and all accessories are ready. A padded table, kept well warmed, is the best place to bathe a baby. The lap of the nurse is the classical location, but the table is much more convenient, and more comfortable for the baby.

Basins of water, with a supply of cold and hot water convenient, a small basin of olive or similar light oil at 100°F., a supply of sterile cotton broken into convenient bits for handling, bland soap, sterile, non-scented talcum or other powder, and a supply of sterile, old soft linen are to be kept at hand. The first bath should have a temperature of about 100° F. The temperature afterwards may be rather less, but should not go below 90° during the first year.

If the eyes have not received an antiseptic or aseptic wash, a few drops of 1% silver nitrate, or 20% argyrol, may be dropped into them.

The body should first be covered with the warm olive oil, gently 'sopped' on with bits of cotton. This softens the vernix caseosa. The nose and mouth should next be cleansed with the warm water and bits of cotton. Each bit of cotton, after being used, is discarded and dropped into a basin to be removed later. The face next, then the scalp, then the body, should be gently bathed with soap and warm water; the rinsing should be thorough in order that no soap be left upon the skin anywhere; especially must the folds of the skin be cleansed from soap. The skin must be very thoroughly and carefully dried with the soft old linen: again with especial attention to the folds; and a very small amount of powder may be used.

In washing the body, any unusual characteristic should be noted and reported to the doctor in charge. The prepuce should be retracted and the glans washed gently. In girls, the washing of the labia should be toward the anus, for obvious reasons.

The diaper should be small and soft, folded in such a manner as to avoid bundling between the legs; a rectangle, pinned at both sides, is the best arrangement.

The band must not be too tight; if it holds the dressings of the cord firmly, that is sufficient. Tight bands are undoubtedly responsible for much of the digestive disturbances and the colic of infancy.

There is, in some parts of the country, a great admiration for wool or silk and wool for infant's underclothing. Whether wool, silk, linen, cotton or mixtures of these are used, the clothing must

be soft, loose and warm. The shirt is usually of knitted material, and it should be absorbent. Over this a skirt of warm soft material, and over this a dress complete the dressing. The shirt, skirt and dress may be fitted together, and all put on together. Several excellent patterns of infant's clothing are on the market; if they are soft, loose, easily adjusted, and without irritating seams, buttons, or knots of harsh tapes, they should be satisfactory.

Rubber sheeting should not be used unless the baby is taken on a journey, or some other emergency prevents the proper removal of wet or soiled diapers.

The time for the daily bath depends somewhat upon local circumstances. The morning bath is classical; so also is the custom of babies to sleep better during the day than during the night. If a good bath is given just before the baby is settled for the night, the night's sleep is usually secured. The morning's superficial washing then requires little time, and leaves the mother with diminished morning burdens, at a time when the average mother most needs extra time.

The night clothing must be very light and not too warm. A single garment, with long sleeves and loose neck, with a soft diaper, is best.



## CHAPTER II

### THE NORMAL BABY AND ITS CARE

The normal baby is the product of many varying factors. Heredity is the first of these, and this is fixed at the time when the two germ cells fuse to make the fertilized ovum cell. The factors of heredity present complicated problems, and the discussion of these far transcend the limits of this volume. Certain diseases and certain tendencies to disease seem to be inherited; these will be discussed as such.

During the ten lunar months of intrauterine life many factors may modify growth and development. It must be remembered that intrauterine life resembles the life of a parasite, in many respects. Food materials are derived from the lymph, itself derived from the maternal blood, and wastes are given to the lymph, and this again to the maternal blood. Variations in the quality of the maternal blood, and variations in the intrauterine pressure may affect the developing embryo or fetus at any time during its development.

The embryo lives directly upon the lymph of the uterus, and this is derived from the maternal blood. There seems to be some selective activity on the part of the uterine wall and also on the part of the embryonic cells.

There seems to be some selective activity on the part of the placenta also, since poisonous materials of certain qualities fail to reach the fetus. Infections may or may not pass through the placenta; or the infectious agent may fail to pass through the placenta, while the bacterial products do reach, and seriously affect, the fetus. The fetus itself has something of the bacteriolytic powers of the adult, and is subject to almost the same types of immunity.

Anaphylaxis in the mother includes anaphylaxis of the offspring, and this may be a matter of some importance.

During labor the baby is in danger, not so much from death as from injuries. Hasty obstetrics is responsible for much human suffering and inefficiency. Twilight sleep has been held responsible also for obstetrical accidents which affect the child adversely. Improper use of forceps often produces cervical lesions, causes cerebral hemorrhage, and may produce other injuries. Versions improperly performed, traction upon the body in after-coming head, long and difficult labor, with pressure upon the rotating head, or upon the shoulder, with injury to the brachial plexus,—all these and many other things done by ignorant or careless or hasty obstetricians injure babies in various degrees. While it may be that the life of the mother is more valuable than the life of the child, it cannot be said that injury to the child is less than the convenience of the obstet-

rician. Certainly a better understanding of the relation between the sickness of a child and the history of its intrauterine existence and the complications of its birth would lead to the avoidance of such causes of injury.

**The Nursery.** The room where the baby is kept is the nursery. If no room can be devoted to the baby, then the family may use the nursery for a living room, or they may eat in the nursery, but it must be understood that the welfare of a baby is more important than aesthetic considerations, or even the comfort of grown people. This does not mean that the comfort of grown people is not to be considered, but only that the welfare of the baby is of first importance, in the room where the baby lives.

This room is the baby's world. Sunshine, not too brilliant, cleanliness, a steadfast temperature of about 70°, reasonable quiet, and the attention of a careful and sensible woman, whether nurse or mother, are certainly not too much to give a baby, even if these mean some sacrifice on the part of people who have passed babyhood.

**Sunshine.** In nearly every climate, all possible sunshine is needed. In summer, or in the south, it may be necessary to shade the room, on account of the irritation of excessive light upon the eyes and the skin. The room itself should be sunned abundantly every day, in all places where this is possible. The great value of sunlight in maintaining normal metabolism has been shown by unquestioned tests upon animals and by the results secured by increasing the sunshine given puny babies in large cities.

**Ventilation** may be secured in any adequate manner. An open fire is often advised; this may be good in certain climates. Various methods are used in different parts of the country; the best should be used for a baby. A room ten feet square, or having an equivalent space, is as small as is desirable; the larger the room the better, for ease of ventilation. The floor is always colder than the other parts of a room; this must be remembered when baby begins to creep and to walk.

**Heat.** The heating methods also depend to a great extent upon the climate. In very cold weather, a good hot air furnace may provide both heat and ventilation; care must be taken to see that the air of the intake is properly fresh, and, if necessary, slightly moistened. Hot water and steam heating systems need watching, partly on account of the dryness of the air, and partly for the sake of the ventilating system required.

The open fireplaces provide unequal heating of different parts of the room, and, if the drafts are not good, they vitiate the air with the products of combustion. Heating with stoves is only satisfactory if the drafts are in good condition. Carbon monoxide passes readily through hot iron; if a hot stove contains burning coal, wood,

or any of the carbons, from which the outlet is not completely free, the carbon monoxide passes freely into the room. This, and other products of combustion may cause serious poisoning,—the more serious in being chronic and causing inconspicuous effects. Gas stoves and oil stoves also vitiate the air. Electric stoves give even and pleasant heat; they dry the air, and the heating unit, if old and rusty, may cause unpleasant odors. The heat should be regulated by thermometers, and not by the variable sensations of older persons. When the baby begins to creep upon the floor, the thermometer also should be placed near the floor.

**The furnishings** of the nursery,—without regard to the other uses of the room,—must be simple and easily kept clean. A smooth floor, not slippery, is best. Rugs must be easily cleaned; it is better that they be washable. If an electric cleaner be used, the rugs may be firmly tacked to the floor, but not otherwise. Walls and ceiling must be smooth, and no poisonous coloring matter permitted. Arsenic poisoning from the fumes given off by certain wall papers is recognized with difficulty, and the death of a baby may be due to this poisoning. No heavy curtains are to be allowed, and no upholstery which can accumulate dust. Furniture must not have any sharp corners or rockers, after the baby begins to creep, and especially after he begins to try to walk. A nursery chair, to be used when the bladder or bowels are to be emptied, is necessary; the vessel must be kept scrupulously clean, and emptied at once after using. A nursery refrigerator may be useful; it must be kept scrupulously clean, and no used bottles permitted to accumulate. When it contains no ice, it must not be used for storage. Diapers must not be washed nor dried in the room, nor must unclean clothing be allowed to remain longer than is absolutely necessary after it is removed.

**At night**, a very small electric light, well shaded, may be allowed when the baby is very tiny, or is ill. After a few weeks, and as long as the baby remains well, the darkness should be complete, and the tiny electric light left in a convenient place for the nurse. If electricity is not at hand a small wax taper or candle may be used. The oil lamp, turned low, gives bad air which can hardly be overcome by many open windows. It should never be permitted.

The temperature of the room at night should be kept at about 60°, unless the baby is subnormal in any way, when it may be kept at 65° or even 70°, as in daytime. It is much better to have the air of the room, which is breathed into the lungs, kept at a lower temperature, and to provide the necessary heat for the bed by warm water bottles, or, better, by an electric pad of the kind that maintains an even temperature. Even these should be examined occasionally, lest by some accident the regulative mechanism may be put out of order, and the baby either chilled or burned.

**The bed** should be firm, without any soft, downy mattress or pillow. A hair, or silk floss mattress may be used. This should be covered first with rubber sheeting, firmly drawn and tucked under. Upon this should be placed a pad which is easily washed and dried and sunned; several of these are necessary. Pieces of blankets, old and soft, may be folded to make such pads, or they may be made from cotton or wool, covered with loose, soft material. The bed covering must be light, not too warm, and large enough to remain in place through the night.

The bassinet may be used until the baby is ready to creep, after that a crib or bed is better. A cariole is good for sleeping out of doors, and it may be used indoors, even at night. If mosquitoes are present, the bed must be carefully screened. This necessitates extra care in ventilation.

It is usually recommended that the baby should be alone in the room at night. If this is not convenient, the nurse should at least have a bed not too near the baby's bed. This provides closer watchfulness, and if the ventilation is adequate, no harm can come from the arrangement.

**Clothing** should be loose, soft, light and moderately warm. The usual dress is as follows:

1. Diapers should be soft, absorbent material, about 27 inches square at first, and larger later, if necessary. They must be washed and boiled before being used, and at each wearing afterward. They must not be washed in washing powder or strong soap, or if such materials are necessary, then the rinsing must be done with extreme care. Ammoniacal diapers are more often due to the use of washing powders than to infrequent washing or to any peculiarity of the baby's urine, as is so often supposed. The excoriation of the buttocks is due to improper care of the diapers, with scarcely any exception. The diapers must not be dried in the room where the baby is kept.

2. Bands are to be soft, broad enough to reach from armpits to hips, and applied with care. They should be firmly placed, so as to hold the dressings of the cord in place, but must not be tight. Very often the colic of small babies is due to tight bandages alone. Certainly many digestive ailments of babies are due to the tightness of the bands. The idea that a baby's abdomen requires holding, or that hernias result from loose clothing, is altogether incorrect. They need not be worn for the sake of the support at any time.

3. Shirts are usually made of knit materials, and they must be loose and easily put on and off. They must be watched to see that the armholes are not too tight; the knit wear grows smaller with washing as the baby grows larger.

4. Skirts may be of soft material when they are required for warmth. They are not needed except for warmth. The old-



fashioned "pinning blanket" is discarded. Skirts and dresses are now made short enough so that the feet are barely covered, and when the baby begins to sit up and to walk, no further "shortening" is required. This is the sensible method of dealing with the question.

5. Dresses should have moderately high necks and long sleeves. They should be long enough to barely cover the baby's feet, so that they will be about the right length when the baby grows large enough to sit up and to try to walk.

6. Wraps are always needed. Soft baby blankets are useful at first; later shawls and coats are needed. The important factors in these articles is that they shall be light and not too warm. The hood or bonnet must not be too warm, and yet must protect the baby's head and ears from chilling drafts. Even in passing from one room to another, a light shawl or blanket is desirable for protecting the baby from drafts.

Every article of the baby's clothes should be washable, and as far as possible should be of such quality as to be boiled without injury. Woolen and silk articles cannot be boiled, and they must be washed very thoroughly with some mild soap, and then be rinsed with very great care. Articles which can be boiled should be, and these also should be very thoroughly rinsed. Whenever it is possible, in northern climates, and every few days, in sunny climates, the clothing, bedding and everything used by the baby should be sunned.

**Training.** The baby may be well trained from birth, or it may be trained into very bad habits as easily. All babies are trained; the only differences are in quality. A baby may be trained to eat irregularly, to sleep restlessly, to jump and cry frequently, to be held in the arms and to be amused and to remain awake late at night; and the result is not good for the baby nor for the man or the woman which may develop.

If the baby receives food regularly and at proper intervals, very soon hunger comes at those intervals. If the intervals are not well judged, hunger may precede the feedings by too long a time, and the baby never seems quite satisfied; if the feedings are too close together, there may be no proper appetite, too little food be taken, and hunger appear too soon after the feeding. If feedings are correctly graded, and this grading must take into consideration the baby's own individuality, a regular and healthy rhythm of hunger can be easily established. It is as difficult to compel a baby to accommodate himself to feeding hours not suitable to him, as it would be to force his bowels to act at another than the natural time.

During the first few weeks, the bowels establish some regular time for defecation. This time, once noted, should be kept in mind. The baby should then be placed upon the nursery chair at that time

each day, and soon there will be no soiled diapers in the daytime, except under unusual circumstances. A similar plan can be followed, a little later, in regard to urination. In some children, neither wet nor soiled diapers are in order after the age of two years; in others the voluntary control of urination may be delayed until four years, or even later, abnormally, while the control of defecation may be delayed until three years or more.

**Crying** is a bad habit, easily formed, broken with difficulty. A baby cries from discomfort; hunger, indigestion, inflamed buttocks, especially when the diapers are wet or soiled, from wrinkled clothing or tight clothing or shoes, from excessive heat or cold or from fright or dislike or desire. For most of these things, it is a good thing that the baby can cry; otherwise he might be neglected. The baby left in discomfort too long and too often soon falls into the habit of crying rather continuously with a thin wailing, distressing sound. Such crying does not fill the lungs, nor give any good results whatever; it is a pathetic indication of neglect.

The child which has been held in the arms too much is trained to be held in the arms; he is uncomfortable and lonesome when he is left on the bed. Naturally, he cries to be taken up; naturally he ceases crying when he is again in the circle of the arms, which has become his natural habitat. The habit must be broken, but it is unjust to do this suddenly, leaving him to "cry it out," which is only another way of saying to "cry himself into exhaustion." Instead, break the habit gradually; first place a small mattress or pad on the lap, then lay this upon the bed; when he cries unduly, to be taken up, let the mother lie beside him for a time; and by means of such gradual methods break off the habit without allowing him at any time to cry himself into exhaustion.

Another habit hard to break is that of constant sucking at something. The "pacifier", the habit of sucking the fingers or the thumbs, or of chewing various unsanitary objects, all are unclean, deforming and injurious. The small baby need not contract such habits; the larger child must have the arms enclosed in rigid tubes (mailing tubes covered with washable cloth are good; they are pinned to the clothing in such a way as to keep the hands from the mouth, but not interfere with exercise).

**Sleeping** occupies about twenty-three hours of the day during early infancy. Gradually this time is diminished, until at one year about fourteen hours are spent in sleep. During baby's sleep, the room should be dark, quiet and well-aired. Sudden noises during sleep are harmful, even when they do not wake the baby. Steady noises are less harmful; bright lights are always injurious. It is usually advised that babies go to sleep alone, on the bed, but many mothers cannot refrain from at least a certain amount of holding at the time of sleepiness. Certainly a baby is better to go

to sleep quietly and alone, and it will do so if it is permitted, from the first. The baby which has been forced into the habit of being rocked to sleep sometimes is compelled, later, to go to sleep alone. Occasionally the mother suddenly changes her custom; instead of holding him in her arms, she puts him into another, perhaps a strange room and bed, and leaves him there to howl himself into exhaustion and the neighbors into rebellion. This is unjust; and long, hard crying, especially in fright, is injurious to the nervous system.

The habit of breathing fresh air is easily established. The baby must be kept warm, and the air taken into the nose should not be too cold. The baby under one month should be kept indoors, well protected. The temperature of the inspired air ought not to be below 70° for a small baby, nor below 65° for the first year. After that, inspired air of 50° is easily endured. There is great tendency to adenoid and tonsil and naso-pharyngeal involvement if inspired air is too cold or too dry.

So long as these temperature requirements are met, and the air is not dry, the more out-of-door air the better; day and night, fresh air is necessary.

In cold climates, indoors, and in hot climates when there seems to be no fresh air, it is advisable to keep the air in motion, and to make it sufficiently humid. This may be accomplished by an electric fan. If the air is dry, it can be made more humid by playing the air from the fan through damp sheets. Experiments carefully performed show that the air not only feels better when it is kept in motion, but also that increased oxygenation is associated with the fresher quality of air in motion, as opposed to exactly the same air allowed to remain quiet.

**Exercise.** During infancy a baby needs to be encouraged to exercise. If babies were not dressed, perhaps they would naturally move about enough; but civilized babies need to have their clothes removed daily, in a warm room, and be encouraged to exercise legs and arms, and back and chest muscles. A finger in a tiny baby's hands, and he tries to raise himself and to pull his body around; it is easy to put a baby even only a few weeks old through a few simple exercises, and as time goes on, to increase their muscular power perceptibly. Only a very few minutes should be spent in this way at any one time; yet this is enough to provide the natural development for the muscles. Whenever a baby is undressed, he should be allowed to lie for awhile, kicking his legs and throwing his arms about, and in the bath also he has fun, laughing and kicking. Even while he is dressed, his movements ought not to be too greatly impeded by clothing. Babies whose care is otherwise quite perfect fail to develop properly without this attention to exercise, and it is here that the personality and the affection of mother or nurse can

have expression,—in playing with the baby and in encouraging him to exercises which promote strength and co-ordination. Common sense is needful, of course; the play should not be too long nor too strenuous; nor should the laughter become tiring.

After the baby can sit alone, if the clothing is loose enough, he provides himself with exercise; still he needs the playfulness and the personal relationship and the laughter. When he is able to walk he still needs somebody to play with him and to laugh with him.

In order that exercising may be safe, the cariole for babies, the crib with high sides, the pens with padding, the swinging chair, the kiddie-car, the baby-walker, all have their proper places. But not any of these take the place of the playful, thoughtful, sensible mother who laughs and plays with him several times each day.



## CHAPTER III

### CARE OF PREMATURE AND DELICATE INFANTS

Premature and delicate infants require special care. The chances of life of delicate infants are small. The distinction between congenital asthenia and prematurity is not always recognizable. The treatment is the same in both cases, but questions of legitimacy may depend upon this distinction. The age of the fetus is not easy to determine, especially since the factors responsible for prematurity may have affected its nutrition. Length is rather more important than weight, though both must be taken into consideration. The following lengths and weights are those given by Ballentyne:

24 weeks: Length, 28-34 cm. (11-13.5 in.), weight, 646 grams (1.5 lbs.)

28 weeks: Length, 38 cm. (15 in.), weight, 1170 grams (2.6 lbs.)

32 weeks: Length, 39-41 cm. (15.5-16 in.), weight, 1570 grams (3.5 lbs.)

36 weeks: Length, 42-44 cm. (16.5-17.3 in.), weight, 1942 grams (4.25 lbs.)

The child born at 24 weeks usually dies very soon after birth; at 28 weeks about one in five lives, with the best possible care; at 30 weeks, about one-half may live; at 32 to 34 weeks, about two-thirds may live, and at 36 weeks to full term, all should live, with care.

**Symptoms.** While the conditions vary slightly in severity according to the age of the fetus, the premature infant displays great weakness. It is thin, wrinkled, very fragile in appearance. The cry is feeble, almost like the mewing of a sick kitten; the limbs are moved feebly and rarely; the skin may be icteric or red or pale or mottled and purplish; the eyes remain almost closed; the respiration is very irregular, and intervals of cessation may occur; it is unable to suck properly, and may be unable to swallow even when a very few drops of water are placed in the mouth. The temperature varies with the surroundings; and this presents one of the great problems of the care of the infant. Atelectasis is common, and respiration may cease suddenly at almost any time, without recognizable cause. These factors indicate the nature of the care to be given the infants born before due time, or those in like condition, due to mal-nutrition.

**Care.** The use of the incubator is falling into disrepute, on account of the difficulty of securing proper ventilation. The air which the premature infant breathes must be the purest obtainable, must be warm and moist; under certain circumstances the oxygen-content must be increased by the use of oxygen tanks. Instead of

the baby incubator, specially devised beds are now advised, and these are placed in warm, well ventilated rooms. Hospitals have special rooms for premature infants, kept carefully ventilated with fresh, clean, moist air. In homes, the nursery can be kept at steady temperature, and drafts avoided by means of screens.

The bed may be devised from materials at hand. A large clothes-basket, with padding and abundance of soft cotton or wool, may be kept at constant temperature by a self-regulating electric pad, or by electric lights, or by bottles filled with warm water. The electric pad must be watched, as the self-regulating apparatus may fail at some time. The electric lights must be varied according to temperature changes in the room. The water bottles should be re-filled one at a time, in order that the temperature may remain constant; the water should not be too hot. All heating agents must be wrapped in padding and kept at some distance from the body of the infant, in order to prevent too great heat. It must be remembered that these children suffer from too great heat as well as from too little; their temperature may run up to an alarming degree if the bed becomes over-heated. A thermometer should be placed between the source of heat and the infant, and this should be consulted hourly, if the infant is very weak, and several times each day in any case.

The care and feeding of premature infants is most important because life itself depends upon these two things. Two points stand out beyond all others in these cases:

The baby must be kept warm.

The baby must have a very weak food.

Remember that a premature baby cannot take the amount of food corresponding to its caloric needs. It must be fed all it can digest and no more.

**Bathing.** Premature babies must not be washed with water. The body should be annointed with warm olive oil and then covered with a cotton or silk and wool garment. Diapers are not to be used. A piece of cotton should be placed between the legs and removed when soiled. The reason for this is that premature babies should be handled as little as possible and the cotton may be removed with less disturbance than diapers.

The baby's temperature should be taken three times daily, always at the rectum, and should be maintained at 98 to 100 degrees.

**Air.** Premature babies need fresh air and this should be provided without draft. They seem to thrive better in moist atmosphere and this may be supplied by placing a dish of water over an alcohol or electric lamp. The temperature of the room should be kept at about 80 degrees.

Remember, the food at first must be very weak. The premature baby cannot suckle, hence the milk has to be withdrawn from the breast with a pump.

**Food.** Breast milk is by all means the best food. Get it, if possible. The mother rarely has a sufficient supply and therefore the milk has to be offered by the mother of another nursing baby.

The baby should be fed every two hours, one dram at each feeding. The breast milk having been obtained should be diluted with boiled water, the formula reading:

Breast milk,  $\frac{1}{2}$  dram.

Boiled water,  $\frac{1}{2}$  dram.

This should be fed three or four days, at which time the quantity may be increased to  $1\frac{1}{2}$  drams. The quantity should always be increased before change is made in the strength.

The milk is to be fed from a medicine dropper, or a Breck feeder. This provides a nipple which stimulates the sucking movements to some extent, and also a bulb by which food is pressed into the baby's mouth.

In some cases it is impossible to get breast milk. Then cow's milk has to be substituted. This is unfortunate as cow's milk is less easily digested and consequently lessens the chances of life. The formula should not be stronger than one part milk and three parts water.

Vomiting and diarrhea frequently develop in these infants. Methods followed with full-term infants do not apply.

Do not use a cathartic.

Do not stop food.

Weaken the food, lengthen the feeding intervals, or both.

Give the baby plenty of boiled water to drink. Offer it between feedings, one dram at a time.

Feedings may be given once each hour until the baby can take more than half an ounce at a time; after that, two hour feedings may be better.

The premature baby must be weighed occasionally; if this can be done without much handling, it should be weighed every day. But it must not be taken up for this purpose, nor must the need for weighing add to its exposure. Not only the gain in weight and length, but also the general appearance of the skin, the increasing energy of its limb movements and its cry, and the increasing efficiency of the respiratory movements, are to be considered. For controlling the feeding, the appearance of the stools and the gain are considered. If the feedings are too close together, or if they are too far apart, the gain is not satisfactory. Every premature or weakly child is a law to itself as to the times of feeding, and it is only by watchfulness that suitable intervals can be established.

Great care is necessary in order to avoid regurgitation; these infants often die from aspiration pneumonia.

**Atelectasis** is a danger which must be considered. The infant may be placed in a warm bath of water, to which mustard may or may not be added, when cyanosis occurs. This usually causes crying and better breathing. The usual methods of artificial respiration may be employed, as in the case of the new-born child which fails to cry and breathe.

**Infection** is another danger. The stump of the cord is a common location for infection; pneumonia is an ever-present menace. These dangers are to be guarded against by the usual methods.

**Prognosis.** The premature infant has not quite an even chance with other infants by the time he has passed the length and the weight of the full term baby. Infancy and childhood may have for him rather more than the usual dangers; and he may present a greater tendency to weaknesses of every kind during later life. Many such children, who seemed to remain for months at death's door, develop into splendid men and women, while others live feebly and suffer greatly from all diseases of nutrition throughout their rather short lives.

Premature children and those suffering from malnutrition are as subject as are other children to ordinary causes of disease, and are much more easily subject to infections. In the treatment of such diseases, occurring in premature or poorly nourished children, the methods must be much more gently applied, and all variations in diet much more thoughtfully considered, than is the case in dealing with ordinary children under similar conditions.

During the last weeks of normal intrauterine life, there seems to be an increased deposit of iron in liver and spleen. This store lasts until mixed diet becomes normal to the child. In premature infants, this store of iron is deficient, milk is low in iron, and such infants may suffer seriously from the lack of iron in the body. Treatment should include the administration of small amounts of iron-containing vegetable juices.



## CHAPTER IV

### LESIONS AND OTHER TRAUMA OF THE NEWLY BORN

(Dr. Whiting)

When the conditions associated with birth are considered, it seems remarkable that so few traumatic conditions occur during this dangerous passage, with its varying pressures and the fragility of the passenger. With more careful study of the causes of the diseases of infancy and early childhood, however, it becomes more and more evident that there are many injuries produced at this time which are responsible for later disturbances, and which have not, until recently, been recognized.

**The bones** of the full term baby are still very soft, with centers of ossification in nearly all of the bones, but with the epiphyses not yet ossified. Separation of the epiphyses is easily produced, especially by traction improperly made during birth, and these may be long unrecognized. Deformities of the bones are thus produced, and this may be responsible for difficulty in later life, according to the location and the extent of the deformity.

Because the bones are so soft, it has been thought that osteopathic lesions of babies were of negligible importance. This is incorrect; not only are they important, but they are even more important in infancy than in later life. Osteopathic lesions affecting the soft, cartilaginous bones of infancy are too often neglected, even by osteopathic practitioners, and thus they remain uncorrected; the malpositions become fixed; the form of the growing bones accommodate themselves to the abnormal positions, and a real, though not necessarily a very serious, deformity results. In some cases, however, the lesion does produce serious effects; lesions of the atlas or axis or other cervical vertebrae interfere with the circulation through the brain, which is undergoing its greatest growth during the years of infancy and childhood; lesions of the clavicle, cervical vertebrae and humerus interfere with normal development of the brachial plexus and may result in Erb's palsy; subluxation or dislocation of the hip becomes fixed, and the crippling due to congenital hip dislocation causes life-long unhappiness.

Osteopathic case records include many reports of babies in whom Erb's palsy has been relieved by correction of lesions affecting the brachial plexus, which lesions had been caused by ignorant or careless obstetricians; babies with abnormal mentality, and with Little's disease, and with other supposedly incurable diseases of unknown etiology, in whom osteopathic treatment has resulted in more or less complete recovery. Obstetrical trauma is not necessarily in-

curable, and with careful examinations, followed by careful treatment, much crippling can be avoided.

**Congenital Hip Dislocation** is easily recognized if the condition is single. Double dislocations may present some difficulty in diagnosis at first. If the hips are normal, only normal motions are possible. If the thigh can be moved up and down, with a telescope motion, the hip is dislocated. X-ray plates give definite information in case of doubt.

Treatment of this condition is simply the correction of the abnormal position of the bones. Examinations must be made at intervals until the child is walking easily, in order that any recurrence or new abnormality may be quickly corrected.

The pelvis should be held firmly by an assistant. The thigh of the affected side is then flexed upon the abdomen, very strongly. Pressure upon the knee, while the knee is rotated outward, should force the head of the femur around below the acetabulum, and permit it to enter through the notch, and thus into its correct location in the acetabulum. This method requires a very short time; no anesthetic is required, and recovery is complete. If this is done, as it should be, very shortly after birth, the development of the legs is perfectly normal.

Slight abnormalities in the position of the feet may be either deformities or the result of pressure conditions before or during birth. These may be corrected by massage, directed by the physician, with such manipulations or surgical methods as are indicated by the individual case.

**Obstetrical paralysis** may be one of the symptoms of intracranial hemorrhage, or it may be due to local injury. Facial paralysis may be due to pressure of forceps upon the facial nerve, usually near the stylo-mastoid foramen, but sometimes upon the ramus of the jaw. Sometimes pressure due to arrest of the head at some point in the birth canal causes this type of paralysis. The injury to the nerve is usually slight, and recovery usually occurs spontaneously in two or three weeks. When the condition is complicated, as it often is, by cervical lesions, recovery may be delayed indefinitely. Correction of the lesions can be secured, even in new-born babies, by very careful treatment. Recovery from the paralysis is hastened by this, and also by local, very gentle massage, inunctions, and such other local measures as the condition indicates.

**Erb's palsy** is a paralysis of the arm, due to injury of the brachial plexus. The nerve fibers may be subjected to tension as the result of cervical or clavicular lesions, in which case the paralysis may disappear within a few hours after corrective treatment. The injury to the nerves may be very severe, and due to direct pressure upon the nerve trunks; in such cases the prognosis is more serious. Pressure due to improperly applied or too forcibly used forceps; pres-

sure upon the rotating head; torsion and pulling upon the arms in the after-coming head, in breech presentations; unskillful efforts at version, all these, and other factors, are responsible for this condition.

For these conditions, prevention is more important than later treatment. Fewer ignorant midwives; fewer family physicians doing obstetrics occasionally, without skill; more skilled and specially-trained osteopathic obstetricians, are the only hope of diminishing these paralyses in children.

After the condition has become fixed, as these children are usually brought for treatment, the prognosis is not very bright. With careful treatment, correcting every condition which might interfere with nutrition and circulation of the affected muscles and of the nerve centers controlling them, are the most important factors. Stimulation of the paralyzed muscles by means of electricity, preferably the faradic current, may help in promoting the nutrition of the muscles. If the faradic current fails to give any good results, the galvanic current should be tried. Massage, usually with oil, helps also to maintain nutrition. Voluntary efforts at motion, even though no motion can possibly be secured, promotes the nutrition of the spinal motor centers, and ultimately may give much help toward recovery. The child should be told that the voluntary efforts are therapeutic, so that disappointment may not interfere with his further efforts; he must be taught to hope always for recovery, but not for immediate recovery, nor should any definite time be mentioned to him.

**Prognosis.** Many cases apparently hopeless have shown remarkable results; other cases with apparently more hopeful prognosis have failed to give the expected improvement. The prognosis must always be guarded, and the most careful and thoughtful and persistent osteopathic treatment be given, whenever this is possible.

**Traumatic hemorrhages** occur, and these produce various symptoms. The occurrence of hemorrhages without recognizable trauma, and for which the cause is unknown, are called "idiopathic". Such hemorrhages are not very rare, and they may occur at any time within the first three or four days after birth. Recent studies indicate that a lack of prothrombin is responsible for this condition. Even in those cases in which trauma is responsible for the hemorrhage, subnormal coagulability of the baby's blood may perpetuate bleeding considerably. No doubt many cases supposed to be traumatic are really due to the idiopathic hemorrhages, in turn caused by the lack of coagulability and perhaps diminished viscosity of the fetal blood. Many other factors have been considered of etiological significance in the tendency to bleeding: asphyxia, plethora; congestion of the umbilical and mesenteric vessels; thrombosis of

the vessels of the cord, with escape of small thrombi into the systemic vessels; small infectious foci; swallowing of amniotic fluid, and many others.

Edematous areas may appear also; these may be due to pressure conditions, or may appear to be idiopathic. They disappear readily.

**Symptoms.** The effects produced by hemorrhages depend upon their location. Although not properly hemorrhagic, caput succedaneum may be included in this group, since it is due to pressure and follows about the same course as do truly hemorrhagic injuries.

**Caput succedaneum** is a swelling upon the scalp, caused by intrauterine pressure acting upon the body of the child, while the scalp over the skull presents at the os, thus being subject only to atmospheric pressure. The tumor is edematous, though occasionally it may contain blood. It disappears spontaneously within a few days after birth, and is of negligible importance. No harm results from its presence, though it does indicate that the intrauterine pressure has been considerable, and that labor has been somewhat prolonged.

**Cephalhematoma** is due to the same conditions, rather more pronounced and serious. It is due to injury to subperiosteal blood vessels, and these usually continue slight bleeding for some time after birth, so that the tumor increases for two or three days. It then diminishes and finally disappears, usually at about the fourth month, if it is large. It may cover the parietal bone almost or quite completely, and may be double, covering both sides of the skull. The presence of hematoma should lead to a suspicion that some cerebral hemorrhage may have occurred; this is verified if the child displays difficulties in digestion, or certain neurotic symptoms later in life.

**Hematoma of the sterno-cleido-mastoid muscle** is due, also, to abnormal pressure, though it may be due to improper methods on the part of the obstetrician or midwife. This tumor, neglected, may be responsible for torticollis of the structural type, for which no remedy can be found if it persists beyond early infancy. The correction of the cervical lesions always associated with this injury, with massage, oil rubs, and other local manipulations, may save the child from this distressing condition.

**Intracranial hemorrhages** may cause very serious symptoms. No doubt many cerebral hemorrhages cause no recognizable symptoms, though they may be responsible for some of the neuroses of later life; but those located in certain areas do cause serious and immediate symptoms. Intracranial and cerebral hemorrhages are due to those factors which increase the pressure during birth, as well as to causes of malnutrition or toxemia, which diminish the



resistance of the walls of the blood vessels. Difficult or prolonged labor, from whatever cause; precipitate labor, with its rapid and excessive pressure changes; breech presentations, especially when unskillfully handled; instrumental deliveries, also with lack of skill in handling, are important obstetrical causes of such hemorrhages.

The hemorrhages may occur at almost any area of the brain. More often they are around the base than over the convexity, and more often over the cerebellum than over the cerebrum. The tentorium cerebelli may be ruptured; the sinuses be injured, by the over-riding of the bones of the skull. The blood may be sub-pial, sub-arachnoid, sub-dural, or extra-dural.

**Cerebral hemorrhages** may be responsible for serious cases of asphyxia; these patients show cyanosis, bulging fontanelle, slow pulse, irregular respiration lasting for some days after the asphyxia seems to have been overcome. Twitchings, rigidity, opisthotonus, convulsions, are some of the more serious symptoms, and these may last several days, with later recovery. Deep reflexes may be increased, pupils dilated or contracted or of irregular outline; strabismus or nystagmus may be present. In such cases recovery is not usually to be expected, nor desired.

Localizing symptoms are more often found when the hemorrhage is upon the cortex, as is to be expected from anatomical considerations.

More common, but often unrecognized, are the small hemorrhages variously located in the so-called "latent" regions of the brain. These show no symptoms, usually, until several days after birth. Then the baby begins to be restless or somnolent beyond normal sleepiness, refuses to nurse, the face is pale, often edematous; cyanosis, disturbed respiration, slow pulse, these symptoms confirm the diagnosis.

When the diagnosis is confirmed, the prognosis becomes very grave; recovery is not expected, and hardly desired, since brain injury of serious nature is evident. However, such treatment as relieves brain pressure may be tried, surgical interference may be considered; some good effects may be secured through early surgical removal of the clots; and the baby has a right to this chance of recovery if the surgeon gives any hope at all. Even if the operation should be fatal, it is better that the child die in the effort to secure recovery than to live, without this attempt, the unavoidable life of a mental defective, probably a paralyzed idiot.

The most urgent factor in the consideration of cerebral hemorrhage lies in prevention. Obstetricians must be taught that injuries to the head of the baby may result in such hemorrhages, and it is far better to risk the death of the baby than to risk its cerebral

injury. Next in importance is the early recognition of subnormal coagulability of the fetal blood.

**Visceral hemorrhages** are most common as the result of long or difficult labor, but they do occur in small children whose birth has been easy. Thoracic hemorrhages are rare; the chest wall, though soft, exerts some protective influence. Peritoneal vessels, the superficial vessels of the liver, and especially the vessels of the suprarenal capsules are often slightly injured. Unless the loss of blood is considerable, no symptoms are manifested by these hemorrhages. Certain digestive disorders, disturbances of the pigmentation of the skin, icterus neonatorum, and other mild disorders of infancy may, possibly, be due to such small hemorrhages.

**Melena Neonatorum.** Blood in the stools is usually black and of tarry consistence, in the newly born as in adults. Small amounts may be mixed with the meconium and be unnoticed. It may be bright red in color when the hemorrhages are low in the bowels. Blood may be vomited; it is then either bright red, dull red, brownish or black, according to the time it remains in the stomach, or according to its origin in the intestines, in more severe cases.

Melena spuria is due to the swallowing of blood from the infant's nose or lungs, or mouth, or from the nipple, or the mother's breast, or it may be from swallowing maternal blood during labor, as in impending asphyxia.

**Symptoms** are various. Blood is discharged on the second to the fifth day; the amount may be slight or profuse. The condition of the blood has already been mentioned. Temperature may be increased, decreased or normal. Anemia and prostration vary with the amount of blood lost, and with any complicating factors. Vomiting of blood renders the prognosis more grave than does uncomplicated melena. If ulcers are present in the stomach or the intestines the prognosis is very grave. Syphilitic cases do not usually yield to any treatment.

**Treatment** for all forms of hemorrhage is practically the same. Surgical removal of the clots may be necessary. Surgical care of ulcers may be indicated. The general care given delicate babies is indicated. In all cases of persistent bleeding, or if there is any suspicion that the blood fails in normal coagulation, subcutaneous or intramuscular infusions of normal human blood should be given. One or two cubic centimeters of blood is taken from the vein of the donor,—usually the cubital,—and injected immediately into the gluteus muscle or the subcutaneous tissues of the baby. Any other convenient site of injection may be selected. The entire procedure must be rigorously aseptic. Occasionally this fails to stop the hemorrhages; another donor should be chosen and the procedure repeated, or transfusion of blood may be done; using a different donor in either case. The blood may be given by direct vein-to-

vein method, or by the citrate method, or by the multiple syringe method. Typing is not necessary for blood infusions, but is required for blood transfusions.

Infants' blood can rarely be typed in any satisfactory manner; and usually it is of the same type as the father,—this is not invariable. If typing seems impracticable, the baby's blood may be tested with the blood of the donor for compatibility; if either laking or agglutination occurs in either the baby's blood, acted upon by the donor, or the donor's blood, acted upon by the baby's, then another donor should be chosen.

In emergency cases, the blood of the father may be used, without previous testing.

A second infusion of the same blood should be given within two days after the first infusion, in order to avoid anaphylaxis.

Feeding with gelatine is advised, especially in the case of gastrointestinal bleeding. The gelatine is given in 10 per cent solution, by mouth.

**Prognosis.** In all hemorrhagic diseases, the prognosis depends upon many factors. If syphilis is a cause of the hemorrhages, the prognosis is bad. If the baby is hemophilic, the prognosis is doubtful. If the bleeding is of the usual idiopathic type, and the amount of blood lost is not great, and if infusions of normal human blood have been given, the recovery may be complete and rapid.

Hemorrhages which injure the brain usually result in permanent disability, if the baby lives at all.

## CHAPTER V

### NON-INFECTIOUS DISEASES OF THE NEWLY BORN ASPHYXIA

(Dr. Whiting)

Asphyxia is a general term referring to all conditions in which there is a lack of oxygen supply to the baby.

During intrauterine life, the fetus gains oxygen and gives off carbon dioxid by way of the umbilical vessels, the placenta, and the maternal blood. At birth, in the normal, full term infant, air begins to enter the lungs freely, expanding the anterior, upper and peripheral areas earliest. The areas around the hilum, the posterior areas and lower parts of the lungs are expanded only after several days of living, even in the vigorous baby. Babies who are weakly may show fetal structure in the lungs weeks after birth; probably the lungs may fail of proper expansion until permanent faulty structure results, in some very frail infants.

Weakness of the chest wall or of the respiratory muscles delays complete filling; babies who are left too long in the same position do not have sufficient exercise of the thoracic muscles to provide thorough filling of the lungs at the normal time. The early crying of a baby when it is moved around does not necessarily mean that there is any pain; crying is the only expression possible, and anything that arouses any response whatever must arouse crying. Crying is the only proof that respiration is sufficiently vigorous, during the first days of life.

**Intrauterine asphyxia** may be due to compression of the cord, or to its abnormal position around the neck of the fetus; separation of the placenta; compression of the brain, and less common causes. Placenta previa; maternal hemorrhages, convulsions, or death; the use of harmful drugs during labor, all may cause intrauterine asphyxia and perhaps the death of the baby. Respiratory movements may be initiated before birth, in which case the respiratory passages of the child may contain amniotic fluid, blood, meconium, and other contents of the uterus. Congestion, with variable hemorrhages, may be found in the viscera and the brain, if the child dies from intrauterine asphyxia.

**Extrauterine asphyxia** is less common; it depends upon deformities or congenital disease of the heart, the respiratory organs, or the brain. It may follow obstetrical accidents, and be due to these. It may also occur in premature or very weakly babies, as the result of softness of the thoracic wall and weakness of the respiratory muscles.



**Asphyxia livida** is the milder condition. The new-born baby fails to cry or to make adequate respiratory movements. The skin does not change from the venous bluish tint to the arterial pinkish tinge, as in normal babies. Cyanosis becomes even more pronounced; the cord pulsates strongly; its vessels are distended; the pulse is strong and slow. Muscular tone is preserved, and muscular irritability.

**Asphyxia pallida** is the more serious. The skin is white and almost cadaveric, though the lips may remain bluish; the muscles are relaxed, and the reflexes abolished; there is little or no pulsation of the cord, which is thin, with flaccid vessels; the pulse is very weak and irregular; the hands and feet are cold; the sphincters are relaxed, and meconium and urine may be passed; there may be a few convulsive twitchings of the limbs and of the respiratory muscles, but the baby seems to be about to die,—indeed death is very near, unless immediate treatment is given.

There is little difficulty in diagnosis; cerebral hemorrhage may be associated with asphyxia; in cerebral hemorrhage the fontanels bulge, and there is coma; respirations may occur fairly well in cerebral hemorrhage, with later symptoms occurring.

**Treatment** of asphyxia livida is usually successful; in asphyxia pallida treatment of the most persistent and careful type is necessary, and this may not preserve the life of the child.

The first step is always to clear the mouth and nose from foreign materials, such as mucous and any inspired matter, which might result from any attempt at respiration before birth. This is done by means of a finger covered with gauze or cotton; the work must be done quickly and gently and thoroughly. The baby may be held with the head down while this is done, in order that gravity may help to bring the foreign materials within reach.

The livid baby may be spanked, and placed in baths alternately hot (104-108°, always tested by the thermometer) and cold (65-70°). The livid baby may be allowed to lose half an ounce of blood, or so, from the end of the cord when it is cut. The pallid baby must not be allowed to lose any blood at all, and the cord may be stripped toward the umbilicus in order to preserve a little more blood for the baby's use.

**Artificial Respiration.** If respiration is not well begun, artificial respiration must be initiated quickly. Several methods are employed by different obstetricians. Swinging the child in the air by the shoulders, pressing alternately upon the anterior and the posterior surfaces of the thorax may cause respiratory movements.

**Dew's method** can be used while the baby is in the bath; places no extra strain upon the heart, and gives no danger of chilling. For this, the left hand supports the upper part of the body, the



thumb and finger being around the neck and the palm supporting the upper part of the back. The right hand supports the thigh, the thumb and finger around the knees and the palm under the hips. To cause expiration, the hips and abdomen are flexed upon the thorax and the head raised; to promote inspiration, the head is extended and the hips and abdomen drawn backward, extending the spine and causing the thorax to be thrown upward. The maneuver is repeated eight to twelve times each minute, in rhythmical manner.

**Byrd's method** is similar; the baby lies with its body upon the hands of the physician, who alternately flexes and extends the body with some force, about ten times each minute.

**Laborde's method** consists in rhythmic traction upon the tongue, pulling it forward and allowing it to relax, ten to twelve times each minute. This is often useful with other methods; an assistant can attend to the tongue while other methods are employed. The movements must be rhythmical.

**Schultze's method** is often used. It is not good for babies with weak heart action, nor those who are very frail, nor for premature babies. The baby is grasped by both the axillae in such a way that the thumbs of the physician are over the baby's shoulders, upon the anterior surface of the thorax, the index fingers under the shoulder, in the axillae, and the other fingers spread over the baby's back. The baby is thus suspended, with the feet hanging downward and the face away from the physician; the baby's head hangs forward at first, and expiration is promoted. Then the baby is thrown forward and upward, by means of pressure upon the back, throwing the ribs forward and causing inspiration. This movement is continued until the physician's arms are nearly horizontal and inspiration is as full as circumstances permit. The body is then thrown further upward until the legs are thrown upward, the body flexed, the head thrown downward, and inspiration is complete. This position is held for a second or two, then the movement is reversed until the body again hangs from the shoulders in a relaxed condition. The entire movement should be repeated eight or ten times each minute. Clumsy attempts at this method are dangerous; the viscera may be injured; the ribs or clavicle injured; various lesions of spinal column or ribs produced, and sudden cessation of the heart follow. There is danger of chilling; the tongue cannot be watched; and while it may give excellent results in the practice of a skillful physician, it should not be used by others.

**Mouth to mouth** inflation of the lungs may be necessary in certain cases. A piece of gauze should be interposed for the baby's protection, and only the first of the expired air from the donor be employed.

Various plans have been employed in which tubes are placed in the trachea of the baby. These are dangerous, and may be used only under special conditions, usually in hospital practice.

Artificial respiration should be maintained as long as the heart beats, and for a much longer time than this if any signs of vitality remain. The heart may be stimulated by manipulation over the precordial or the upper thoracic area of the spinal column. When the baby cries vigorously the manipulation may be stopped, but for several hours the baby must be watched, since it may be that the respirations may again cease. In that case the artificial respirations must be renewed, as in the beginning. Great care is needful to prevent chilling in the second series of manipulations. Sometimes when the respiration becomes somewhat irregular and cessation seems to be impending, the thorax may be alternately extended and slightly flexed without taking the baby from its bed. This gentle increase in the efficiency of the respirations may be all that is necessary to promote normal activity.

**Prognosis.** For intrauterine asphyxia, the prognosis is good after normal respiratory movements have been well established. After two days, the outlook is as good as in normal children. Asphyxia itself does not seem to cause further injury, though it must not be forgotten that asphyxia and cerebral hemorrhage and other adverse results of obstetrical complications very often co-exist.

For extrauterine asphyxia, the prognosis is not so good. The very fact of extra-uterine asphyxia signifies serious derangement, if not deformity, weakness is invariable, and the condition must always be considered grave.

### TRANSITORY FEVER

Very commonly newly born babies show sudden changes in temperature, especially sudden rises which persist for a short time or a few hours, and disappear as suddenly. This fever may appear at any time within the first four days, and it may last for one or two days. It may reach 102°F. or more, without marked symptoms of serious disease.

**The etiology** is not known. That the heat-regulating apparatus is not quite efficient for the early weeks of life is generally conceded. The absorption of the degenerative products from the stump of the cord; the irritation to the kidneys caused by the abundance of uric acid normally present about the time of birth; irritation to the lungs caused by inhalation of air, which may be too dry or otherwise irritating; hunger, or dessication of the tissues; rapid oxidation of the tissues due to increased oxygen supply, all of these factors have been offered in explanation of this fever. The fever is most pronounced in those babies in whom the initial loss of weight is greatest, which may be due to the influence of the fever on weight, or the loss of weight and the fever may be due to the same cause.

**The symptoms** are not pronounced. The appetite may be diminished, or the babies may display considerable avidity. They may seem hungry, but refuse to nurse; or they may nurse freely when water is given alone. They are usually restless and lose weight. If marked prostration occurs, or symptoms of serious disease, the fever is probably due to infection. In any case, infectious processes should be suspected and careful examination made.

**Treatment** must be devoted to increasing the water-intake, first. Food may or may not be increased, according to the condition of the baby. Gentle manipulation of the spinal tissues may show some slight tension of these; very slight and steady pressure is indicated until this tension disappears. Search for some infectious condition should be thorough and, if any can be found, it must receive immediate treatment. If there has been any undue exposure of the baby to sounds, light, or handling, this must be prohibited. If the baby has been too warmly covered, or if the room is too warm, this must be remedied.

The prognosis is good, if the fever is of the simple transitory type without complications.

## JAUNDICE

The liver seems to be an organ of the most variable functions, before birth as during after life. Before birth, it serves as a most important area for hemopoiesis. Bile is formed by the liver at about the fourteenth week of intrauterine life, and glycogen is stored by the liver at about the twentieth week. At birth, the changed circulation with the passage of an increased amount of blood through the liver, leads to increase in the amount of bile formed. Several diseases characterized by jaundice appear at birth or within a few days thereafter.

**Icterus Neonatorum.** Soon after birth, most commonly on the second day, icterus appears in many healthy babies. About 20% of normal babies have noticeable discoloration of the skin; about 80% show traces of icterus on careful examination, and practically every baby has an increase in the bile-content of the blood serum on the third day after birth. The discoloration usually disappears within a few days; most commonly on about the fourth day after it appears.

**The etiology** is obscure. According to Abrahamow, the increased circulation through the liver, with associated increased secretion of bile, causes an overflow of the bile into the blood. This increased amount of bile is supposed to be somewhat more viscid than usual, also. Other theories have been suggested; that there is increased destruction of erythrocytes at birth; that there is some partial occlusion of the blood vessels or ducts; that there is slight catarrhal inflammation in such babies. Since the icterus is so widely prevalent,

it seems that it may be considered as a physiological rather than a pathological condition.

**Symptoms.** Aside from the icterus, the symptoms are usually negligible. Some slight drowsiness may be noted, but this is not invariable. Restlessness is unusual. The stools contain bile or bile derivatives in about the normal amount. The urine contains no bile recognizable by ordinary tests; more delicate tests do show bile, but this is true of normal urine, also.

Treatment, other than that given to normal small babies, is not indicated. No ill effects follow the condition.

Prognosis is excellent. It does not add to the severity of other diseases of infancy. Any ill effects supposed to be due to the icterus are really due to complicating factors or to a mistaken diagnosis.

**Familial Jaundice of the Newly Born.** This rare disease affects several or all of the children in one family. Nothing can be found to account for the condition. The baby is born apparently normal, after an apparently normal pregnancy. A few hours or perhaps a day after birth, the baby becomes drowsy, jaundiced, and may have convulsions. Death is inevitable within the week. No autopsy findings explain the jaundice, the stupor, the convulsions or the death.

**Exfoliative Dermatitis.** In the normal baby, exfoliation of the epidermis occurs after birth imperceptibly; especially when the skin is properly bathed and oiled. Occasionally frail and weakly infants, or those neglected or unwisely cared for, suffer from abnormalities of this exfoliation. Certain authorities consider local infection an agent in etiology, also.

The epidermis may be thickened, dry, horny or scaly, first; the upper layers then peel off, leaving a thin delicate skin beneath. This grows normally, and recovery occurs. In other cases the epidermis shows milia, or bullae, and these peel off, leaving reddened and inflamed skin beneath. Recovery occurs within ten days or two weeks. Relapses may occur, rarely. The prognosis is good, except for the complicating and etiological factors.

Treatment consists in the use of ointments, bathing, and protection of the newly formed skin.

**Edema Neonatorum.** Edema is a symptom of several diseases of infancy. Very rarely in premature or very feeble infants an edema occurs for which no adequate cause can be found. It appears during the first day; begins over the lower abdomen, spreading to the legs and sexual organs; it may reach the hands and other parts of the body. The swelling appears first, but does not pit; later there is pitting as is usual in ordinary edemas. Death occurs within a few days. Treatment is of no avail; the baby should be cared for as are other weakly or premature infants.

**Sclerema Neonatorum** is characterized by progressive thickening and hardening of the skin. It is most common in premature or very feeble babies, or those who have poor care, unhygienic surroundings, and who suffer from wasting diseases.

The symptoms appear soon after birth; first a hardening of the feet or legs, extending over the body rather slowly and steadily. The skin is waxy and cold; the subcutaneous tissues give a sensation rather like tallow, on palpation. The baby grows weaker and more somnolent, takes little or no food; the temperature remains subnormal; the pulse weak and rapid; the baby dies apparently from inanition.

The pathology is not understood. There is great loss of water in all tissues of the body. Atrophy of the connective tissues have been described.

The diagnosis is easy from the beginning; no other disease shows such hardening of the skin.

Recently recovery has been reported as the result of the use of thyroid medication. Babies supposed to be dying have made fairly good recovery. Thyroid, 1/16 grain per day is given. Rectal irrigations of sodium bicarbonate solution once or twice each day are used to combat the acidosis. Further care is that of the premature or delicate child (q. v.)



## CHAPTER VI

### INFECTIOUS DISEASES OF THE NEWLY BORN

(Dr. Whiting)

Before birth, the fetus may share in almost any infectious disease from which the mother suffers. If labor begins during the progress of an infectious disease, the baby may show the usual symptoms of the disease, as if the infection had been extra-uterine. The further treatment is that of the infection, with such modifications as the condition of the baby (prematurity; inanition) warrant.

During birth, any infectious agents which may be in the maternal vagina or upon the labia, may affect the baby. Immunity is very low during the first few weeks of the baby's life, and it is thus very susceptible to these infections. After birth, the umbilical stump presents an open wound, connected with ligated vessels, in which processes of atrophy and degeneration are occurring and which are intimately associated with vital organs, especially the liver, the lungs and the heart. For these reasons, infection of the newly born is serious and is avoided only by keeping the vagina of the mother, the umbilical stump, and indeed everything that comes into contact with the baby, as aseptic as is possible. Rarely infection is taken into the body with milk from an infected breast.

**Infectious organisms** include all pathogenic bacteria and protozoa, at times. The most common are staphylococcus pyogenes aureus and albus; streptococcus, gonococcus, bacillus coli, bacillus pyocyaneus, pneumococcus and the organisms of the acute infectious diseases. Erysipelas is probably an unusually malignant type of the streptococcus.

**The symptoms** vary somewhat with the location of the infection. At any time within the first two weeks, but usually with the first week, fever occurs, with a very irregular temperature curve. Rarely fever is lacking, and the temperature may be subnormal. Wasting is constant and rapid. Icterus is usually marked; hemorrhages are very common, they may occur at any cutaneous or mucous area, and usually occur at the umbilicus also; restlessness, with rolling of the head, muscular twitchings or convulsions and a feeble, constant whining cry are almost invariable. Later stupor supervenes. Pulse is rapid and weak, and respiration irregular; diarrhea is frequent, stools are dark with blood, and foul; vomiting is common; the baby seems very much more seriously ill than even these symptoms necessarily indicate. Further symptoms depend upon location.

**Omphalitis.** The infection is found in and around the umbilicus; it probably resulted from infection of the stump of the cord. Tis-

sues around the umbilicus are infiltrated and hardened; the skin is red; pus may exude or may accumulate in the cellular tissue or anywhere in the neighborhood of the umbilicus. The stump may appear well healed, and yet a pus focus attain serious size in the neighboring tissues. Abscesses resulting from this infection may be single or multiple. Gangrene may follow; or the infection may involve the liver and other organs.

**Umbilical vessels.** Arteritis may follow omphalitis, or may occur without recognizable infection of the stump of the cord or neighboring tissues. The umbilical arteries contain pus and septic thrombi, with the usual changes in the walls of the vessels. Infection is usually transmitted by these infected vessels to the liver and other organs of the body very quickly. The veins are usually affected throughout their extent from umbilicus to liver, when phlebitis does occur. Jaundice is common in phlebitis of the umbilical veins.

**Peritonitis.** The peritoneum may be locally or extensively involved. Vomiting, gas pressure, and abdominal pain are present. The temperature is usually very high; leucocytosis is pronounced. The pathology is that of adult peritonitis,—purulent exudates, adhesions, pus pockets in the folds, and hemorrhagic areas.

**Lungs.** Broncho-pneumonia or pleuro-pneumonia are less common. Cyanosis, rapid respiration, recession of the thoracic walls on inspiration, are suggestive of pulmonary involvement. It is not often recognized during life.

**Heart.** Pericarditis and endocarditis are rare. They are not recognized, as a rule, during life.

**Meninges and brain.** Meningitis may follow peritoneal or pulmonary infection. Encephalitis is usually associated with meningitis. Stupor, dilated pupils, opisthotonos, convulsions are suggestive; fontanels bulging, general rigidity, localized paralyses, with fever or, rarely, subnormal temperature, make the diagnosis fairly positive. Lumbar puncture may determine the infection. Recovery is not to be expected, nor desired.

**Digestive Tract.** Inflammation of the mouth is not common but may be severe. The stomach and intestines usually share in the inflammatory state, as is indicated by vomiting and diarrhea. Ulcers may occur, and are probably always fatal.

**Joints and Epiphyses.** Inflammations of the joints are usually gonorrhoeal, and are apt to be associated with ophthalmia. At autopsies, it is sometimes found that what had been supposed to be arthritis was really an inflammation of the epiphyses. There may be some difficulty in differentiating this condition from that due to syphilis.

**Subcutaneous Tissues.** Abscesses may occur anywhere on the body. They are to be drained and properly dressed; usually they cause no further ill effects.

**Tetanus Neonatorium** (Lockjaw). This disease is now very uncommon. The infectious agent gains entrance by way of the umbilical wound, and the disease results. The diagnosis is evident when the characteristic trismus occurs. Treatment is hopeless; the child may be fed by a rigid tube placed in the mouth; after the convulsions initiated by this have subsided, water or milk may be given very slowly through the tube. Death is to be expected within a few hours or days.

**Ophthalmia Neonatorum.** This is usually a purulent conjunctivitis. A mild form may be due to exposure to the light; this shows only slight inflammation, which clears up with return to a properly dim room. There may be photophobia and some excess of secretion. Ordinary pyogenic bacteria may cause a purulent conjunctivitis, not so severe, usually, as the more common gonorrhoeal type. The infectious agent gains entrance from the mother's vagina, or from the hands of physician or nurse, or from the use of septic dressings, sponges, towels, or other articles.

**Symptoms.** The inflammation begins as a slight redness, and this develops with remarkable celerity into the serious condition. The eyes cannot be opened, the lids are red and swollen; pus exudes from between the lids; there may be some bloody streaks in the pus. Both eyes are usually affected. Occasionally by immediate care, infection of the second eye can be avoided. If the pus accumulates beneath the swollen lids, the cornea may be perforated and the aqueous humor invaded.

**The treatment** consists in keeping the tissues in as nearly a normal condition as possible, and in removing the infectious agents. Very gentle osteopathic treatment, with especial reference to the neck and the shoulder girdle, maintains normal circulation and promotes the most speedy recovery possible. The removal of the infectious agent is secured by keeping the pus washed away from under the lids by means of an aseptic fluid, and in keeping the temperature of the eyes from rising to too high a degree. Soft bits of linen dipped in icewater and laid over the lids give relief; they must be kept constantly renewed. Irrigation should be repeated at about half-hour intervals. A medicine dropper may be used. Saturated solution of boracic acid, 1-10,000, or 1-5,000 solution of bichloride of mercury, have been recommended. Porter and Carter advise either 1 per cent boric acid, or borax, 2 per cent, or normal salt solution, for irrigations.

Care must be employed in giving the irrigations. The best way is to wrap the baby in a sheet, thus restraining movements and preventing infection of the hands. Lay the baby on the side, with

the affected eye downward, with a shallow pan beneath the eye. Cover the upper eye with gauze, to prevent its infection. Drop the fluid at the inner canthus, allowing it to run downward beneath the lids and outward into the pan. If the infection involves both eyes, turn the baby over to irrigate the other eye. Avoid allowing any liquid to run toward the inner canthus.

Once each day the eye should be irrigated with 1% or 2% silver nitrate, or with 10% solution of argyrol or protargol. Great care is needed to prevent spread of the infection to other babies in a hospital, to nurses or other members of the family, and other tissues of the baby's body.

The eyes may be treated by continuous irrigation with excellent results. Constant attention is necessary, and this means a day nurse and a night nurse, with occasional help from others. Boracic acid solution, about half-saturated, is used; it must have been boiled and cooled to about 103°F. It is allowed to flow very gently from a glass tube with small orifice into and over the eye. This continuous flow removes the infectious agent constantly, and permits the tissues to recover. If the temperature seems too warm for comfort, it may be allowed to cool, but if a somewhat higher temperature is comfortable, the irrigation should be kept at that degree. The continuous irrigation may be kept up for ten minutes, then cold compresses be applied for twenty minutes; then the hot irrigation given again for ten minutes and so on. In other cases it is more comfortable to maintain the hot irrigations unchanged constantly. Many cases of very severe gonorrhoeal ophthalmitis have been completely cleared up in this way within two days, and no corneal ulcers occurred. Several cases of conjunctivitis due to amebae histolytica yielded to this method in two days, and vision was not injured.

Prophylaxis is more important than treatment. If proper care has been employed at the time of birth, this infection cannot occur.

**Prognosis.** With early and careful treatment, recovery is complete. Neglected cases develop perforation of the cornea and total and incurable blindness.

**Mastitis.** Very often the mammary glands secrete a milk-like fluid, containing colostrum bodies, after birth. This is true for both sexes in about equal numbers. Probably the cause is the presence in the child's blood, of the hormones stimulating the milk flow in the mother, which have passed from mother to child through the placenta. The condition is not abnormal, and no harm results from it unless unwise and meddlesome attempts to empty the breast have been made.

Occasionally the breast is bruised or infection allowed to enter the nipple, resulting in inflammatory processes; and even to abscess formation. The evacuation of the pus, and the application of sterile



dry dressings usually lead to uneventful recovery. The occurrence of mastitis may be a serious matter in female infants; the breast may be injured beyond recovery.

### Rare Diseases

**Epidemic hemoglobinemia** (Winckel's Disease) is a rare disease usually fatal, and almost certainly of infectious origin, though the infectious agent has not yet been discovered. The symptoms are first noted during the first week, or, rarely, later. The disease is usually fatal in two days. Restlessness, loss of appetite, and prostration are first noticed, then cyanosis and icterus; the skin rapidly becomes bronze in color. The temperature is normal or subnormal throughout the course of the disease. Respiration may be accelerated; pulse is usually unmodified. The urine becomes brownish in color; is voided frequently with straining, becomes smoky, and contains hemoglobin in considerable quantity, kidney cells, casts, urates, but does not contain bile.

Treatment is devoted to maintaining strength until recovery can occur; the directions for the care of premature or delicate infants include all useful points. Death is to be expected, but a few cases do end in recovery.

Since it is infectious, isolation and the most complete disinfection are indicated.

**Fatty Degeneration** of the newly born (Buhl's Disease) seems to be infectious, though the exact agent is unknown. Colon bacilli have been reported in the blood stream, and micrococci have also been reported.

Babies suffering from this disease show history of asphyxiation, usually rather profound and obstinate. Rarely it occurs in babies not at all asphyxiated. After apparent recovery from asphyxia, the baby does not seem well; shows diarrhea, with tarry stools, vomits blood, bleeds from the umbilicus, from mucous surfaces, and shows sometimes also cutaneous ecchymoses. Fever is usually absent, but may be slight. Rarely no external signs of hemorrhage are found. No hemoglobin is present in the urine.

Fatty degeneration of all glandular organs and the heart is found at autopsy.

Treatment can only be symptomatic, and is hopeless.

**Pemphigus Neonatorum; Bullous Impetigo.** This condition is present at birth in most cases, though it may appear later. The skin becomes reddened, serum accumulates beneath the reddened areas, forming bullae. The skin slips and loosens, and finally tears away, leaving a red and moist surface, covered by very fine layer of epithelial cells. By the coalescence of these bullae, great areas of the body may become completely denuded. The condition resembles that which might be caused by scalding with hot water, though it is less painful. Syphilitic lesions resemble it also. The child appears very ill and wretched, and seems about to die,—as, indeed, he very quickly does.

The bullae contain staphylococcus and streptococcus. At autopsy these organisms are found abundantly, not only in the skin lesions but also in many organs of the body; the lungs are usually pneumonic, occasionally atelectatic, and always contain the bacteria mentioned.

The disease is actively contagious. Children suffering from it, and their nurses, must be absolutely isolated. After the death of the baby, all infected articles must be destroyed by burning, if possible; or must be very completely sterilized.



## CHAPTER VII

### MALFORMATIONS

The gross malformations attract notice at once. Malformations of internal structures and slight deformities often receive no attention during life, being recognized only at autopsy, if this is performed. Such deformities appear to exert no adverse influence upon physiological processes, though undoubtedly many of the so-called functional diseases are due to such unrecognized internal deformities.

**Etiology.** The causes of malformation seem to be many. Experiments performed upon animals in many laboratories show that the use of alcohol or other drugs by either parent; the existence of any disease characterized by toxemia or malnutrition; the presence of any abnormal conditions, such as spinal lesions, affecting the circulation through the reproductive organs in either sex, increase the percentages of deformities in the offspring.

Abnormalities of the uterus itself, or of the bony pelvis, may cause imperfect development through pressure. Tumors may exert enough pressure to interfere with development within the uterus, though this seems to be less important; tumors large enough to prevent normal development usually prevent conception; this is not invariably the case. The growth of tumors during pregnancy has also to be considered. Attempted abortions may interfere with development; this may be due to poisoning of the embryo or fetus by drugs, or to the injury caused by the inefficient uterine contractions. The conditions responsible for the desire to produce abortion may also be responsible for adverse hereditary or intrauterine influences.

Experiments performed upon animals in various large laboratories, indicate that whatever injures the mother's health may increase the percentages of deformities. Drugs have been tested with reference to the effects produced upon the offspring, and it seems that the rule is almost without exception,—“Any drug which affects the maternal organism adversely, cannot be considered harmless to her offspring.” Alcohol and certain other drugs, administered to males, exercise more or less harmful effects upon their offspring.

Experiments have been performed in osteopathic laboratories, notably those of The A. T. Still Research Institute, in the study of the effects of bony lesions upon offspring. Lesions of the lower thoracic and upper lumbar spinal column affect the circulation through the pelvic organs, diminish the proportion of fruitful matings, increase the proportion of abortions and of obstetrical accidents, and affect the young born of lesioned

parents invariably are less vigorous, more susceptible to infection and to the effects of excessive heat or cold, or improper food, than are the young of normal parents. Various deformities are abundantly present in the young of lesioned parents, while they are extremely rare among the young of apparently normal parents. These experiments prove that the normal baby must be born of parents who are well, who do not use drugs, who live hygienic lives, and who do not have any vertebral or other lesions, using the word "lesion" is the osteopathic sense of the term.

Many profound deformities may appear; these usually terminate life at birth or within a few hours afterward. Less marked deformities permit life, of a sort. Others do not seriously interfere with normal living, while very many yield to correct surgical methods. Perhaps no field for investigation offers more important results than the study of human deformities and their causes. Not only the gross deformities, but also the various minute and hidden deformities of the viscera and the brain, interfere greatly with human ability and human joy in living. For such information as has been gained along these lines, reference must be made to books on Embryology and Teratology.

Such malformations as are recognizable at the time of birth, whether grossly or by careful examination, are sometimes curable by suitable manipulative or surgical measures. Malpositions of the feet, for example, may be corrected by faithful stretching and pulling, and thus permanent deformity or a surgical condition be prevented. On the other hand, when the use of such gentle manipulations fails to correct the deformity, surgical measures ought not to be too long delayed. Such deformities include flat-foot, hare-lip, adherent prepuce, adherent digits, tongue-tie, crossed eyes, and many others. These conditions are easily corrected in early life, and the many secondary harmful effects thus prevented.

**Hernia** into the umbilical cord is rare, and is due to developmental defect. It may be slight, and only a small loop of intestine protrude; or it may be that there is total eventration, in which nearly all of the abdominal organs remain outside the body. When only intestinal coils occupy the sack, immediate surgical correction of the condition may result in complete recovery; the prognosis is good, though the tumor may be very large. On the other hand, if other organs occupy the sack, surgery gives little hope; the deformity then is of more serious type, including blood vessels and perhaps nerves, thus preventing adequate repair.

The common umbilical hernia is due to protrusion of a loop of intestine through the umbilical ring in the abdominal wall. It is more common in females, and is usually a very simple affair. For its treatment, a pad should be placed over the umbilicus, and this held in place by a bandage or adhesive straps. Folds of the skin

over the umbilicus, held in place by crossing diagonal strips of adhesive, are the best arrangement. The dressings should be changed twice each week, or oftener, and should be used for several months, or longer, should the condition persist. Small hernias disappear without treatment, usually.

**Meckel's Diverticulum** may protrude into the cord or through the umbilicus. It may resemble granulations or fungus of the umbilicus. It is a reddish, moist tumor and may present a small opening at its end. It is usually patulous, forming a direct tract into the intestine. It varies in size from a small pea to a considerable mass of intestine, and it may, very rarely, be associated with hernia of the intestine.

If it is small, a ligature may be applied which will cause its disappearance. The larger masses require surgical treatment, and the prognosis is uncertain at best.

**Umbilical Granuloma.** Granulations may appear at the umbilicus after the cord has fallen off. If neglected, a vascular polyp may become developed. Improper care of the cord, probably with a mild infection, is the usual cause.

The granuloma should be burned with silver nitrate or other caustic; dry dressings applied, and careful attention be given to prevent further infection. The polyp should be cut at the pedicle, and treated as are the granulomas.

**Nevus; Birthmark.** Several types of birthmarks are found. Their cause is, so far, unknown. These marks are considered very commonly to be due to emotional or affectional events during pregnancy, but it is very evident that during nine months of ordinary life no area of the body could escape being affected by some maternal impressions. Pressure conditions have been considered of etiological importance. No experimental work has yet been done which explains the occurrence of these marks.

**Vascular nevus** is found at birth, or may appear shortly after birth. It consists of bluish or reddish spots; slightly elevated or level with the normal skin; the color is due to dilated capillaries, and disappears on pressure. Larger areas, usually flat, "port wine stain", or "nevus flammeus", may cause great disfigurement, and may cover considerable areas of the face and neck. In another type the arterioles are dilated, resembling erectile tissue; it is called "angioma cavernosum" for this reason. This mark is elevated and the color is rather deep purple. It may pulsate, and later in life may vary in turgidity under the influence of emotions.

**Mole**, or pigmented nevus, is very common. It is found upon face, neck or back, usually; may be single or multiple; flat or elevated; smooth or hairy; pigmentation varies in depth.

The mole is composed of a great overgrowth of the cuboidal cells in the cutis, and the rete and corium are deeply pigmented.

Birthmarks may disappear within a few weeks after birth, or may remain permanently. Any local irritation may cause them to disappear; or to assume malignant characteristics, or may not affect them at all.

**The treatment** is rather a matter for the dermatologist or the surgeon. Vascular nevi may yield to injection of acids or caustics; to carbon-dioxid snow carefully applied, to electricity, or to any one of several agents for causing contraction or destruction of blood vessels. Electrolysis may be used for removal of the hairs of moles. Moles themselves may be removed by caustics, acids, X-ray, or the electric cautery. Surgical excision of the disfiguring mark, with skin grafting if the denuded area is large, has been done successfully. If any such mark begins to grow rapidly, it should be immediately removed by clean and thorough surgery.

**Prognosis.** Occasionally such marks assume rapid growth of sarcomatous nature. In such cases immediate surgery is necessary. The dangers of these marks are due to accidents. Being usually vascular, they bleed freely on slight injury. Rarely such an accident results in their disappearance. The skin over them is usually fragile, and infection is easy. Methods employed for their removal often result in infection. Irritation may result in malignant development. In all these conditions, the treatment is that of the accident.

**Congenital Obliteration of the Bile Ducts; Congenital Cirrhosis of the Liver.** This is rather a rare disease, of unknown etiology. Syphilis apparently is not a factor. Developmental defect of the bile ducts does occur, very rarely. Atrophy of the liver follows. Probably the cirrhosis is due, in the fetus, as it is in the adult, to an inflammation resulting from toxic substances in the blood stream. Whether this toxic substance is the result of disturbed metabolism of the fetus, or is derived from the maternal blood, it is impossible to say at the present time.

Jaundice is the most noticeable symptom; it appears at birth, or within the first four days. The jaundice increases rapidly; the stools lack bile; there may be no meconium whatever; clay stools appear if the child lives a few days; the urine is dark and shows abundant bile; the liver and the spleen are greatly enlarged; hemorrhages are occasional, and may involve any area of the skin or mucous membranes; digestive disturbances are not usually severe, though always present to some extent; weight and strength diminish steadily, and the baby dies from malnutrition within a few weeks. Rarely life may be maintained for several months; never more than a year.

Surgical exploration is indicated. If there is any remediable cause of obstruction, this may be removed and recovery result. If no cause can be discovered; if the cirrhosis is marked and the small



ducts obliterated, the death of the child is hastened by the operation. Since death is inevitable unless the cause of the obstruction can be removed, the operation is indicated as soon as the diagnosis has been verified. Aside from surgical intervention, the only treatment is for the relief of the symptoms. The milk should be low in fat; otherwise the care advised for premature and delicate infants is the best that can be given.

For malformations of the various organs, see the chapters upon these organs. For the malformations due to syphilis, fetal rachitis, and other systemic diseases, see chapters on the diseases mentioned.



## CHAPTER VIII

### THE FEEDING OF CHILDREN BREAST FEEDING

Breast milk is the best possible food for a nursing infant. There can be no argument on this point. Comparison of the infant death rate in cities shows a great majority among bottle-fed babies.

Marasmus, diarrhea and other wasting diseases of infancy, which end fatally, are nearly always seen in bottle-fed babies. Convulsions, colic and digestive disturbances are much more common in the artificially fed.

It is never wise to stop breast feeding until every effort has been made to correct feeding habits and improve the mother's supply of milk.

Breast milk is particularly important in the first few weeks of life. A baby that has breast milk, if for no more than four or six weeks, has a far better chance of healthy childhood than one artificially fed.

How is it possible to determine whether a baby is successfully fed at the breast? Here are the signs:

Regular, normal gain in weight.

One to three normal stools per day.

Absence of vomiting.

Normal digestion.

Normal sleep (20 hours out of the 24)

There are certain signs which indicate that a breast-fed baby is not thriving but which do not necessarily mean that the baby should be taken from the breast. These signs include:

Failure to make a normal gain in weight.

Abnormal stools (constipation, diarrhea, curds, etc.)

Vomiting.

Crying while nursing or upon being removed from breast.

When any of these symptoms are present, it is necessary to investigate the feeding habits and correct errors. The mother's habits (diet, exercise, etc.) must also be considered and faults rectified.

There are certain well defined contra-indications to breast feeding. They include:

Loss or failure to gain in weight, accompanied by indigestion, which has extended over a long period.

Pregnancy in mother.

Puerperal convulsions.

Diseases: epilepsy, typhoid fever, pneumonia, tuberculosis, nephritis, primary or secondary anemia, syphilis when contracted after birth, malignant disease.

Conditions may arise which make it wise to remove the baby from the breast temporarily, resuming breast feeding later. These include:

**Menstruation.** Some babies thrive at the time of the menstrual flow, if it is established during the nursing period. Other babies develop pronounced digestive disturbances, while the menstrual function is active. In these cases it may be wise to feed the baby a formula during the period of each flow, returning to the breast when the flow ceases.

Acute, brief illness of the mother may indicate temporary discontinuance of nursing.

Acute vomiting or diarrhea on the part of the infant, indicates temporary removal from the breast.

When the breast is discontinued for only 24 hours, unsweetened water only should be given. If it is necessary to feed artificially for a longer period a formula not stronger than one third milk and two thirds water, without sugar, should be started. This may be gradually increased and sugar added if it has to be used several days.

Breast feeding should be started from four to six hours after birth. The baby should be put to the breast every three or four hours thereafter or until it begins to nurse readily. By the second or third day the three-hour nursing schedule should be established. Mothers should be instructed to follow a rigid schedule of seven feedings in 24 hours at 6, 9, 12, 3, 6, 9, 2. Wake the baby at feeding time. Do not allow feedings at irregular times because the baby cries.

Do not give water, sugar and water, barley water or any other mixture to the baby during the first two or three days of life. To do so upsets digestion, prevents the baby from taking hold of the nipple and fails to help the baby's bowels move. The more water a baby gets before nursing habits are established, the less likely it is to take the breast. The baby does not need water the first two or three days. Water given at that time does not prevent loss in weight.

Sugar should never be given during the first few days of life. It causes vomiting and diarrhea.

Colostrum supplies all the baby's needs until the milk flow starts.

If the milk fails to appear by the fourth day, bottle feeding should be started.

Cathartics should not be given to an infant. They should never be given to the mother during the first few nursing days. Calomel and salts exert a particularly harmful effect.

There is no fixed rule for the nursing period in breast-fed babies. The time the baby is to be kept at the breast depends upon the

infant. Many babies get sufficient food in five or ten minutes. Others require 20 minutes. Let the baby decide. When enough food has been taken the baby will stop and go to sleep. This differs from the procedure to be followed in artificial feeding. It is ignored in many cases with the result that the baby is forced to eat too much or is kept awake unnecessarily after it has had enough.

Under ordinary conditions an infant should be offered only one breast at each feeding period, the breasts being alternated. If one breast does not give a sufficient supply of milk, it is best to complete the feeding by giving cow's milk, properly diluted. In certain cases in which the breast milk is too rich for the baby's digestion it may be well to offer the baby each breast. In doing this the time it takes the baby to nurse should be carefully noted and one half that time only should be devoted to each breast. This is only to be done as a temporary expedient.

The position of the baby during nursing is important. The infant should rest over the mother's arm in a semi-reclining position so that the nipple may be taken freely. The mother should lean forward slightly.

There are cases in which the milk comes from the breast too rapidly and causes digestive disturbance. This may be remedied by raising the infant and holding the breast up or the mother may slightly compress the breast just back of the nipple, slightly reducing the flow.

If the baby cries when taken from the breast, goes to sleep and wakes before the next nursing period crying, it is an indication that there is a deficient supply of milk. This condition may be helped by completing the feeding with a formula.

Breast-fed babies often cry at night. This may be due to hunger. During the night the mother has rest, and has plenty of milk for the day. During the day she is busy, and has little milk for the night.

At times there may be a sufficient quantity of milk but it may not be sufficiently strong. In these cases the baby will fall asleep after nursing but will soon wake crying. The cry continues, usually, until the baby is fed. This condition accounts for the irregular and frequent feedings practiced by so many mothers. It may be overcome by attention to the mother's diet or by reducing the time of each nursing period at the breast, completing the feeding by a formula.

Do not use pepsin or other preparations to help in these conditions. The syrups so commonly used are harmful.

In view of the declining use of corsets it may not be necessary to call attention to the fact that they should not be worn during nursing. High corsets irritate the breasts and interfere with nursing.

Analysis of breast milk is of little value in most cases but it is often necessary to make it to satisfy parents. The composition of breast milk changes so frequently and so many errors are made in procuring specimens for analysis that the procedure is of little value. Analysis should be made at a well equipped laboratory.

The first milk from the breast is poor in quality, the last is rich. Hence, neither of these is satisfactory for analysis. To get an average specimen the time it takes the baby to nurse should be carefully noted. The baby should be allowed at the breast for one third of that time. Then an ounce of milk should be withdrawn with a breast pump and this should be used for analysis.

**Anaphylaxis** to mother's milk is rare, but this possibility must be considered when obstinate diarrhea, colic, and occasional convulsions or other nervous symptoms occur without other recognizable causes, in a breast-fed baby. The stools are usually foul and contain much undigested milk and much mucin. Nervous symptoms often follow feeding immediately. If osteopathic examinations show no cause, if the milk gives normal findings on repeated analyses, anaphylaxis should be suspected.

Some foreign proteid may be in the mother's milk, derived from some article of food which she is unable to digest properly. Careful study of the mother's diet and the child's illness may show that the child suffers from an attack about a day after the mother has eaten a certain article of food. In this case that food should be eliminated from the mother's diet list. If no such history can be obtained, and if there is no article of her food which seems to cause any symptoms in herself or the baby, she should be placed upon a diet composed of only one or two articles of food for three days; if the baby remains well, other articles may be added to her diet at intervals of three or four days until she is eating normally. If the anaphylactic symptoms persist when the mother has this very limited diet, other food should be substituted until the anaphylactic symptoms disappear. After this other articles of food may be added, very gradually, until the mother has a diet list which is adequate for her needs and which provides milk adapted to the baby's requirements. Whenever the baby suffers anaphylactic symptoms after she has taken a different food, that food must be avoided afterwards.

If no article of food can be found responsible for the baby's symptoms, it may be necessary to secure a wet nurse or to put the baby upon a formula. If it seems important that the baby continue on the mother's milk, the child may be given a subcutaneous injection of about one cubic centimeter of milk.

Breast feeding should never be abruptly discontinued except in an emergency. The infant should be kept at the breast for a week or ten days, the physician, in the meantime, regulating all the feeding habits. Special attention should be paid to the mother's diet, exercise, sleep and environment.

Babies, gaining normally in weight, frequently have gas and cry half of the 24 hours each day. This may indicate a food too rich. To correct this the mother's diet should be limited. Reduce liquids. Eliminate sweets, pastry and fresh fruits. Asparagus, cabbage, turnips, cucumbers and tomatoes should also be temporarily denied the mother. The feeding time may be reduced but this



should not be done unless the baby is gaining more than the normal amount for its age.

The mother's diet and general care are highly important in all cases in which there is difficult breast feeding. Altogether too much liquid is given in these cases. Excessive use of milk, cocoa, porter and other things to increase or change the breast milk are usually harmful and usually fail to produce any increase in the milk flow. A well regulated, normal diet is the best for a nursing mother. It should consist of three good meals each day, without food between meals. Fruits, vegetables, meat and milk should form the bulk of the diet. If the mother is under weight, milk between meals and a glass before retiring is helpful. Malted milk or some of the proprietary food preparations may be of value here.

Here is a diet for a nursing mother that has been used with success:

Breakfast: Prunes or baked apple, cereal with milk and cream, one or two boiled eggs, toast or bread, coffee or cocoa.

Noon: Beef, lamb, chicken or fish, potatoes and one other vegetable, custard or fruit. Milk.

Night: Cereal, salad, milk.

There are so many widely different ideas on diet that it is difficult to offer a satisfactory schedule. The point is to give the mother food she can digest and assimilate.

Constipation in the mother is a difficult problem. Osteopathic adjustment, a diet of the coarser foods, with an occasional enema and a mild mineral water usually overcomes this trouble.

### **HOW TO FEED THE NORMAL BABY**

The simplest method by which a baby may be successfully fed is the best. Manifestly it is impossible to feed a sick baby unless one first understands how to feed a normal baby.

There are no hard and fast rules in artificial feeding. Common sense and experience are the two fundamental things necessary to achieve success.

Always remember that you cannot make a baby eat. The baby's appetite changes from day to day and often from feeding time to feeding time. The baby is not unlike the adult in this respect. Remember also that when a baby nurses at the breast there is no thought on the part of the mother as to how much the baby is to get. The baby simply takes what he wants and then quits. You cannot improve on nature's plans, hence you cannot force a baby to eat. All you can do is to so modify the formula that it will be digestible and when digestion is normal the baby will take what he needs.

This does not mean that certain rules have not been worked out satisfactorily. They have, but the rules serve only as guides and



in the beginning all feeding is experimental. Remember this and you will not be disappointed.

The normal baby will take many kinds of mixtures and thrive. This accounts for the many successful methods of feeding. The method that is most easily mastered, that can be carried out by the mother with the least work and that makes the baby thrive is the best. In this country the percentage and the caloric methods are most in vogue.

In the early days the percentage method was recommended as one by which the percentages of cow's milk might be made similar to the percentages of human milk. This theory was untenable and the method is now used for accuracy. The method is somewhat cumbersome and for that reason it has been supplanted to a great extent by the caloric method, which is simpler and therefore more easily mastered.

### THE CALORIC METHOD

It must be remembered that the caloric method is not perfect. For instance, the required number of calories required by a given infant could be supplied by sugar alone but the infant could not possibly digest and thrive upon such a diet. A food containing the essential elements; proteids, fat, carbohydrates, salts, water and vitamins must be provided. We know that these elements are provided in milk, sugar and water mixtures, with orange juice added after a certain age.

Remember, again, that the rules that follow are essentially guides and are more frequently broken than followed in detail. Common sense must be the guide to success.

A formula for a well baby must be so prepared that it will maintain nutrition and promote growth and it must also be digestible. We are convinced that no one element in the food is at fault in those cases in which we fail but that the trouble is probably in the relationship of the different elements. Therefore we have reached the conclusion that in feeding cow's milk it is wise to reduce all the elements and to make our additions with only one; viz. carbohydrate. High fat and a high percentage of carbohydrate are not easily digestible in an infant's intestinal canal and therefore we do not now feed the top milk and cream mixtures formerly so popular.

Our problem in feeding a well infant is to keep that baby well. To accomplish this we must guard against infections from milk and from indigestion due to curd formation. This is done by boiling the milk.

The number of feedings per day, the amount at each feeding, the amount to be given in 24 hours, the amount of milk, sugar and water to be used, and the number of calories all have to be definitely and accurately considered.

In using the caloric method one must know the caloric value of milk and sugar.

One ounce of sugar = 120 calories.

One ounce of milk = 20 calories.

These figures must be remembered.

Success in using the caloric method depends upon the judgment used in determining the number of calories a given infant requires in 24 hours. Fortunately, experience of many men has provided a rule which may be safely followed.

This rule is based on the number of calories per pound of weight of the baby to be given in 24 hours. A fat baby needs fewer calories per pound of weight than does a thin baby. Infants under five months require a greater number of calories per pound of weight than do those more than five months of age.

The rule for providing calories may be stated thus:

Fat babies over five months require 35 to 40 calories per pound of weight in 24 hours.

Thin babies of any age require 40 to 50 calories.

Very thin babies of any age require 50 to 60 calories.

Estimation of the number of calories required is the most important part in preparing a correct formula. It requires fine judgment and considerable experience. If there is fault here, failure in feeding will follow.

When the number of calories per pound of weight to be given in 24 hours is determined there are other points to be decided. These include:

How much sugar?

How much milk?

How much water?

How much food in 24 hours?

How much food at each nursing period?

In preparing a formula it is easiest to first determine the amount of sugar to use. We know that one ounce of sugar equals 120 calories. To determine how much sugar a baby may have this rule has been evolved:

A well baby weighing more than 10 pounds may have one and one half ounces of sugar in 24 hours.

A well baby weighing under 10 pounds may have one ounce of sugar in 24 hours.

This rule, of course, does not apply to those babies who have never had sugar. Neither does it apply in sickness.

The number of calories and the amount of sugar the baby is to have in 24 hours being determined, the next step is to decide how much milk is to be given.

ILLUSTRATION: An infant weighs 14 pounds at four and one half months. This would be a baby above the average in weight, in other words a fat baby. It could safely be estimated that this baby may have 40 calories per pound of weight in 24 hours.

$40 \times 14 = 560$  calories, the number to be given in 24 hours.

This baby being more than ten pounds in weight may have one and one half ounces of sugar in 24 hours.

One ounce of sugar = 120 calories.

One and one-half ounces of sugar = 180 calories.

Thus, of the 560 calories to be fed, the sugar furnishes 180.

$560 - 180 = 380$  the number of calories to be supplied by the milk.

One ounce of milk = 20 calories.

$380$  divided by  $20 = 19$ , the number of ounces of milk to be supplied.

The formula now reads:

Milk 19 ounces.

Sugar  $1\frac{1}{2}$  ounces.

Manifestly the baby cannot be fed this mixture. The quantity of food the baby is to get in 24 hours must now be determined. But before this can be correctly stated it must be known how many feedings the baby is to have in 24 hours and how much it is to have at each feeding.

Following the rule that the baby is to be fed every three hours, we find that this baby is to have six bottles. It has passed the age for the 2 a. m. feeding.

Now that we know there are to be six feedings we must determine how much to give at each feeding

The rule to determine this point is that:

A baby may have at each feeding one or two ounces of food more than it is months old. This is a fat baby  $4\frac{1}{2}$  months old, therefore we estimate that it may have six ounces at each feeding.

$6 \times 6 = 36$  ounces, the total amount of food the baby is to get in 24 hours. The quantity of sugar is ignored in fixing the quantity of food.

Milk furnishes 19 of the 36 ounces. The rest must be supplied by water. The formula now reads:

Milk 19 ounces = 380 calories

Water 17 ounces

Sugar  $1\frac{1}{2}$  ounces = 180 calories

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560 calories

These rules are elastic and must be varied to suit the given condition.

### CALORIES IGNORED

It has been stated that the rules for caloric feeding are frequently ignored. In fact it is rarely that all of these rules may be closely followed.

First of all, it would be impossible to follow these rules with a new born infant. The question here arises, How much may we offer? It has been demonstrated that in the beginning the infant will not take more than an ounce of food at each nursing period. As there are to be seven feedings in 24 hours, the baby would take about seven ounces at first. It is not feasible to prepare a formula of only seven ounces, hence it is suggested that 20 ounces of food be prepared.

Of what is this 20 ounces to consist? Experience has demonstrated that a formula consisting of one part milk and three parts water, without sugar, is satisfactory. Hence the formula is written:

Whole milk 5 ounces

Boil together for three  
minutes, stirring con-  
stantly.

Boiled water 15 ounces

Divide into seven bottles and feed at 6, 9, 12, 3, 6, 9 and 2 a. m.

The food that the baby leaves after each feeding is to be thrown away.

At the end of five to seven days the baby will be taking the entire three ounces at each feeding and it is time to increase the strength of the formula.

The mixture must not be changed from three parts water and one part milk too suddenly, therefore when the baby is taking all of the three ounces of the formula first offered, an ounce of milk is added to the formula, the quantity of water remaining the same. The formula now reads:

Whole milk 6 ounces.

Boiled water 15 ounces.

If this is satisfactorily taken, the formula may again be changed the following day to read:

Whole milk 7 ounces.

Boiled water 15 ounces.

This method, the addition of an ounce of milk, may be followed every other day until the baby is getting half milk and half water. Then the formula reads:

Whole milk 15 ounces.

Boiled water 15 ounces.

A mixture containing a greater proportion of milk than this should not be given under three months in ordinary circumstances. If the addition of milk causes disturbance the formula may be reduced by an ounce of milk, this ounce being added in a day or two.

While the milk has been increased, sugar has also been added to the formula. The stools are the guide in giving sugar. After the meconium has disappeared and the stools have become normal (yellow, firm, free of curds and mucus) one teaspoonsful of sugar may be added to the formula. The kind of sugar is at the discretion of the physician. The writer prefers cane sugar. If the first teaspoonful of sugar is well taken, another teaspoonful may be added in two days and so on until one ounce of sugar is provided.

Cane sugar or sugar of milk may cause fermentation. If this occurs, dextri-maltose may be substituted. It requires four teaspoonsful of dextri-maltose to equal two teaspoons of cane sugar.

The sugar should be increased or decreased according to the condition of the bowels, always remembering that the baby under 10 pounds in weight is to get not more than one ounce of sugar.

A similar procedure should be followed with infants who have diarrhea, vomiting, or who have been suddenly taken from the breast. The same holds true with infants who have been underfed, overfed, or who have a loss of appetite. At times infants who have not had cow's milk, but who have been fed other artificial food are presented for treatment and in these cases the above method should be followed.

No matter what the age of the infant may be, it is unwise to start with a mixture stronger than one-third milk and two-thirds water.

### MIXED FEEDING

Occasions arise in which it is wise to combine breast and cow's milk in feeding infants. This is called mixed feeding. It is a very important part of infant feeding.

There are two types of mixed feeding. One in which the baby is put to the breast at each feeding period, the feeding being completed by a cow's milk mixture from a bottle.

In the other type a cow's milk mixture is offered to take the place of an entire breast feeding. This may occur only once a day or as often as at every other nursing period.

In most cases the first type is indicated. This type is best because the baby is less likely to refuse the breast, a more even food is supplied and the breasts are stimulated to better secretion by frequent use.

Mixed feeding is indicated by the following conditions:

Failure to gain in weight, a condition usually accompanied by digestive disturbances and constipation.

Inability on the part of the mother to allow the baby to nurse at both breasts. Such conditions are present in mastitis, and in cases where one breast may be injured and be temporarily useless.



Cases in which it is necessary for the mother to be away from the baby a part of each day.

At weaning time.

A breast-fed baby should gain six or eight ounces per week if it is in health. A gain of less than that amount extending over a few weeks indicates trouble, the cause usually being in the feeding habits or in the mother's milk.

In ordinary cases it is best to observe the baby for a week before instituting mixed feeding. This gives opportunity to correct feeding habits. If at the end of the week there has been no increase in the amount of weight gained, mixed feeding should be started. If, on the other hand, the baby has gained three ounces per week before being brought to the physician and it gains five or six ounces during the week of inspection and after feeding habits have been changed, it is wise to continue the breast an additional week with the hope that mixed feeding may be entirely avoided.

In certain cases the baby's condition may be such that mixed feeding should be started without a week's observation. Emaciation is an instance.

The preparation of a formula in mixed feeding is not as important as in exclusive artificial feeding. It is impossible to follow the rules of caloric feeding as there is no way to estimate the caloric value of the milk from the breast.

All of the milk in the breast should be given to the baby at each feeding. Only one breast should be offered. Usually a period of five to ten minutes suffices to strip the breast. The mother can usually tell when the breast is empty. When the milk ceases to flow the baby becomes restless and refuses to nurse. Then the bottle should be offered.

A weak cow's milk and water mixture should be used at the start of mixed feeding. One third milk and two thirds water, without sugar is a good rule. The quantity offered at each feeding should be ounces equal in number to the months of age. Example: A baby four months old should be offered four ounces of milk and water mixture.

The strength of the formula should be gradually increased in accordance with the baby's gain in weight and digestion.

After the baby has had the formula a week or more sugar may be added. Cane sugar may be used. It should be given in quantities of one half a level teaspoonful in the day's formula. This may be increased. Sugar helps the baby to gain in weight and also tends to correct constipation. If too much sugar is given the baby may refuse the breast. If this occurs, remove or reduce the amount of sugar used.

The bottle should be prepared according to the rules given in the chapter on artificial feeding. The bottle should be warmed and ready to offer to the baby as soon as it finishes the breast.

When a baby is four months old it is a good custom to offer it one bottle a day. This gives the mother a rest and an opportunity to get recreation that is denied when she has to nurse every three hours.

### ARTIFICIAL FEEDING

Certain fundamental facts must be known by the physician before he can successfully direct the feeding of an infant. Among these, history taking is of prime importance. Under this heading should be included every detail of the infant's life as well as its general physical condition.

The mother will rarely impart all the facts necessary and it is therefore wise for the physician to ask a series of questions. A list of questions used by the writer in every case in which he directs the feeding follows:

How old is the baby?

How many children in the family?

How were they fed?

How many are living? If any died in infancy, what was the cause?

How has baby under observation been fed?

How often fed? How much at a feeding? How long does it take to finish a feeding?

How much milk, water and sugar is included in the 24-hour formula? If a proprietary food is used, how much is given in 24 hours and how is it prepared?

What kind of sugar is used?

Does baby take all food offered?

Is baby satisfied after each feeding?

How many stools does baby have in 24 hours?

How long was the baby fed at the breast?

Are cathartics used? If so, what?

Does the baby vomit? If so, is it before or after feeding or is it continuous. What is the character of vomiting?

How does the baby sleep?

What does the baby weigh? (This should be verified)

What was the weight at birth?

There are many other questions that have to be asked but this list gives a working basis.

The physical examination should be thoroughly and carefully carried out. It should immediately follow history taking.

**Skin.** The skin many times gives valuable points in diagnosis. Redness about the buttocks and genitalia always suggests a fermentative condition in the intestines.

Inelastic, wrinkled skin indicates emaciation with its accompanying intestinal disturbances. Eczema, roughness, redness, scaling, boils, etc, also indicate digestive trouble.

The wrinkled skin is a sluggish skin and suggests that other organs in the body may be in like condition. It is a bad sign.

One of the earliest signs of recovery is the return of a smooth, glossy skin.

**Color.** Pallor is always present in atrophic or marantic babies. It is also found in some fat babies. In the latter it indicates a badly balanced food. A lack of vitamins is a frequent cause.

**Mouth and Teeth.** The tongue of an infant should be examined at every visit. A coated tongue is often the first sign of a digestive disturbance.

An inflamed mouth frequently causes a baby to refuse food.

An infant's gums should be examined carefully. Digestive disturbances are aggravated during the teething period. Teething probably does not cause indigestion but the irritation of the nervous system produced by the inflammation of teething does lower resistance and thus aggravate any underlying causes of digestive disturbance. Lancing the gums is an effective aid in some cases.

**Abdomen.** Distention is the most marked symptom displayed by the abdomen in intestinal disturbance. It is found in simple indigestion, in the more serious forms of intestinal disease and in rickets. Lessening of the distention together with change in the color of the infant is one of the first signs of improvement.

A sunken abdomen is frequently found in cases of prolonged diarrhea. There is marked loss of tone in this condition.

The entire abdomen should be examined to determine the condition of the liver, the presence of fluids or masses. The spleen should not be neglected.

In older children the X-ray often gives valuable information.

**Temperature.** An infant's temperature should be taken in the rectum. In the new-born there is frequently a rise in temperature to 101 or 102 degrees. This is called starvation fever. Later in life a temperature usually indicates an infection.

A subnormal temperature is found in marasmus and in cases of extreme emaciation.

**Growth.** The height, weight and muscular development should be noted. A baby too fat for its age is probably overfed. The underfed baby is undersized. The improperly fed baby is also undersized.

**Rickets.** Evidences of rickets should never be ignored.

## FEEDING DIRECTIONS FOR MOTHER

All directions for feeding should be written. By doing this the mother avoids error and there can be no misunderstanding of the physician's orders.

Four ingredients enter into the making of the average formula: cow's milk, water, sugar, milk modifier. The quantity of each should be definitely stated. The following is a good form:

Milk .....	ounces
Water .....	ounces
Sugar .....	level teaspoonfuls
Modifier .....	teaspoonfuls
Divide into .....	bottles and feed .....
hours.	ounces every .....

Unless otherwise stated whole cow's milk should be used. By whole cow's milk is meant milk from which the cream has not been removed.

The formula for the entire 24 hours should be made at one time and at the same time each day. This rule should be followed except in those cases in which a proprietary food is used. Condensed milk is an illustration of this exception.

Fresh milk should always be used in preparing a formula. The milk should be put on ice as soon as it is delivered to the house and should be kept on ice until the hour for making the formula. Before the bottle is opened it should be inverted and reversed several times so the cream may be thoroughly mixed with the milk.

Always use boiled water in the formula. The water should be boiled and the sugar added while the water is hot. The mixture should then be placed on ice and be added to the milk only when ice cold.

The sugar is measured with a teaspoon or tablespoon. A level spoonful should be used. A level spoonful is procured by dipping the spoon in the sugar and then scraping off the spoon with a knife.

When the formula is complete it should be evenly divided into as many bottles as the baby is to get in 24 hours. Each bottle should be stoppered with sterile absorbent cotton and then be put on ice and kept there until feeding time.

At times it is wise to boil the milk. When this is to be done the cold water and milk should be mixed in sufficient quantities to provide for the day's feeding. Boil the mixture for three minutes, stirring constantly. Add sugar when the mixture is removed from the stove and put in feeding bottles. Cool by placing feeding bottles in cold water before putting them on ice.

Utensils necessary for preparing a formula include: nursing bottles enough to provide for the number of feedings in 24 hours,



a half dozen nipples, brush for cleaning bottles and nipples, aluminum pan for boiling water, glass jar in which to keep boiled water until it is mixed with milk, bottle rack to hold nursing bottles, covered bowl for borax solution in which to keep nipples, spoon for measuring sugar, measuring glass, pitcher, funnel to fit nursing bottles.

Care of bottles and nipples: Each bottle should be washed immediately after feeding. First clean bottle with soap and water and bottle brush, then put bottle in boiling water. Put a teaspoonful of borax in the bottle and fill with hot water. Put bottle full of borax solution in bottle rack until time to make formula for the following day.

Selection of the nipples is important. The hole should be of a size sufficient to allow the baby to get the feeding in 20 minutes. A hole too large or too small may lead to digestive trouble. A nipple too long may cause vomiting.

New nipples should be boiled. After each nursing the nipple should be washed in hot water. It should be turned inside out and scrubbed with a brush. Then it should be boiled. After boiling, the nipple should be placed in a bowl filled with a strong borax solution and kept in this solution until needed for the next feeding. The bowl in which the nipples are kept should be covered.

All utensils used in preparing the formula should be boiled before using.

At feeding time take one bottle from the ice and place it upright in a pan of hot water. Remove cotton stopper and put nipple on. Test milk for warmth by allowing a few drops to fall from the nipple to the forearm. The milk should be at body temperature when fed. Do not allow mother or nurse to put lips to nipple to test the milk.

### COW'S MILK

Cow's milk is the best substitute for human milk. It contains the elements found in breast milk, in different proportions it is true, but so present that a modification suitable for an infant's stomach may be made.

The elements necessary in any infant's food are fat, proteid, carbohydrate, salts and water. To prepare a formula properly, these elements must be so arranged that they can be digested and assimilated. Various methods by which this may be accomplished have been developed, some of which are too complicated to be of any value. The tendency today is toward simplicity, hence the use of whole milk, sugar and water, in proper proportions, forms the basis of most formulae.

A comparison of the elements in human and cow's milk follows:

	Proteid	Fat	Carbohydrate	Salts
Human milk	1.6%	4%	7%	0.2%
Cow's milk	3.2%	4%	4.5%	0.7%



Different specimens from the same breast vary in the percentages as do specimens from different mothers. The same holds true of different specimen's of cow's milk. The above figures represent the average. This explains why herd milk is better than milk from an individual cow. It is more likely to be uniform.

There are marked differences in the digestibility of the two forms of milk. The digestion of the calf takes place largely in the stomach, hence the milk it gets must be of a different quality than that for an infant. The difference is found chiefly in the proteins. Human and cow's milk each present two kinds of protein, casein and albumin or whey protein. In cow's milk there is more casein than whey. In human milk there is more whey than casein.

Casein of cow's milk coagulates in the stomach in a tough, leathery curd. Human milk forms a soft curd. The problem in feeding cow's milk is to make the curd soft and easily digestible.

An understanding of the part the proteids, fats and carbohydrates play in the digestive processes is important. They must each be supplied in quantities and form to be digested and assimilated by the individual baby to be fed. Therefore, it is well to consider each in detail.

**Proteids** build tissue and replace nitrogenous waste. Cow's milk contains more proteid per ounce than human milk and in addition has the added objection, in feeding humans, of presenting much more casein or that part which forms a tough curd. It is an easy matter to approximate the percentages of proteid in human milk by diluting cow's milk with water but this does not solve the problem of making the curd more digestible. Several methods for overcoming the casein difficulty have been evolved. They include:

Boiling.

Addition of alkalis.

Peptonizing.

Addition of cereal diluents.

Boiling is the simplest and most successful method. In addition to the effect upon the curd, boiling destroys any harmful bacteria in the milk. Boiling makes the curd soft and flocculent.

The chief objections to boiling are that it is said to cause rickets, scurvy and other nutritional disorders and that it brings on constipation. Much experimental work has been done to determine these points. The results show that, tradition to the contrary, boiling milk does not cause malnutrition, rickets or scurvy. In certain cases, particularly where boiled milk is fed for a too long period, there may be a tendency to constipation. This condition, however, is not difficult to correct and the advantages of boiling the milk far outweigh the disadvantages of temporary constipation.

Boiling milk certainly helps materially in many cases in which proteid is not easily digested.

**Alkalis.** The addition of alkalis is a popular method of aiding curd indigestion. The most commonly used alkali is lime water. As ordinarily offered to the infant it is without value. One ounce of lime water to 20 ounces of food is the common rule. To be of value the lime water must constitute 40 to 50 per cent of the milk in the mixture.

Sodium citrate or sodium bicarbonate may be used. Sodium bicarbonate tends to upset the infant's digestion. Two grains of either to the ounce of milk is the proper amount to use.

**Peptonizing** prevents the formation of a curd, but it is a method that has little to recommend it. There are easier ways of promoting curd digestion. Milk fed through the rectum should be peptonized.

**Cereal Diluents.** Gruels are successfully used to aid proteid digestion. Barley water is the most common. In young infants gruels may cause intestinal indigestion. In later stages of the nursing period they are very valuable.

**Protein Milk** is difficult to prepare but is a milk that may be successfully used, particularly in a hospital or with an infant in charge of a nurse. It is prepared as follows:

Heat one quart of milk to 100 F., add four teaspoons essence of pepsin and stir. Let stand at 100 F. until curd has formed. Strain off the whey. Press curd through sieve several times, adding sterile water until one pint has been used. Then add one pint of butter-milk. In cases in which there is fat indigestion the milk may be skimmed before the curd is made.

**Fats** produce heat and energy and are a necessary part of any formula. Fat is difficult to digest and therefore should not be given too freely. Four per cent of fat is the limit for any baby and it should, in most cases, be much lower than that.

The average four per cent cow's milk, when diluted to meet the proteid requirements of a baby, contains fat enough. When there is a deficiency of fat, particularly in mixtures of one fourth milk and three fourths water, or one third milk and two thirds water, this deficiency may be overcome by the addition of sugar. This is possible because fats and sugar are interchangeable, serving much the same purpose in feeding.

In those cases in which additional fats are required, they may be supplied by cream or olive oil. Olive oil is best administered apart from milk. One to three teaspoonfuls a day is all the average infant can tolerate. Rubbing the body with olive oil is without food value as there is practically no absorption through the skin.

**Sugar**, like fat, produces heat and energy. Three forms of sugar are in common use in infant feeding. They are: cane-sugar or sucrose, malt-sugar or maltose and milk-sugar or lactose.

Cane sugar is the cheapest and in feeding well babies is satisfactory. Malt sugar is a mixture of maltose and dextrin. In difficult feeding cases, this is the best form of sugar to use because it is more easily digested and assimilated than any other form of sugar. It is always indicated in fermentative cases in which sugar is used at all.

The most common forms of malt sugar are Mead's dextri-maltose, Mellin's Food and malt soup extract. These are to be used as sugars only and are not to be considered complete foods.

Milk sugar is rapidly passing out of use.

Sugar is one of the most important parts of an infant's diet. It has a laxative effect and theoretically constipation may be corrected by proper feeding of sugar. Some infants with a diarrheal tendency cannot take sugar. Sugar may be measured as follows:

Dextri-maltose: 4 level tablespoons = one ounce.

Milk sugar: 3 level tablespoons = one ounce.

Cane sugar: 2 level tablespoons = one ounce.

**Starch**, which comes under the classification of carbohydrates, is a valuable factor when used as a diluent. Barley and oatmeal water are the most common in use. Starch should not ordinarily be used before the sixth or seventh month.

## CHAPTER IX

### WEANING

Weaning, at any stage of the infant's life, is an important event and one that requires careful attention to the feeding. Weaning should always be a gradual process, except in cases in which it is necessary to abruptly terminate breast feedings, such as disease and injury to the breast or death of the mother. In some of these instances wet nursing should be adopted.

A baby should never, except in rare cases, be kept at the breast after it is one year old. Many infants are nursed for 18 months and there are instances in which the infant is kept at the breast two years. Nursing past twelve months is likely to cause anemia, rickets and malnutrition.

An infant should never be entirely taken from the breast before it is one year old, if it is at all possible for the mother to continue nursing. Even a small quantity of breast milk is of distinct advantage.

Most mothers have an insufficient supply of milk after the eighth or ninth month and mixed feeding should be then begun as a gradual process of weaning. All healthy babies should be fed from a spoon or cup at eight or nine months of age. It is better to begin with the spoon or cup than with a bottle because it is easier to start the exclusive artificial diet at one year, if the infant has early been trained to take food in this manner. When babies are fed on a bottle for 18 or more months it is difficult to get them to take coarse foods.

In starting weaning, the baby should be given one artificial feeding per day. This should be continued a week. Then two artificial feedings are given. The third week three feedings are given and the fourth week the baby is taken entirely from the breast.

The first feeding should consist of farina, cream of wheat, oatmeal, rice or cornmeal. Only one should be given each day but a different one should be given each day until all kinds have been used. Then repeat. If the baby is constipated, the coarser cereals are best.

In the beginning it is best to offer the artificial food at the nine o'clock feeding time. When two feedings are given the second should be offered at three p. m.

When the baby is weaned the four-hour schedule is indicated. A good diet follows:

6 a. m. Cereal, milk, toast.

10 a. m. Eight ounces milk, crackers or bread or zwiebach.

2 p. m. Cereal and milk or baked potato and butter, puree of peas or spinach and carrots.

6 p. m. Eight ounces milk, crackers or toast.

10 p. m. Glass of milk.

Babies should not be weaned at twelve months if they are sick and it is unwise to start weaning during the excessive heat of July or August.

### **When to Feed a Baby Solid Food**

When can a baby take solid food? This is one of the important points to be decided as the infant progresses.

The first solid food should rarely be offered before the baby is nine months old. This first food is usually starch and is given in the form of cereal or bread.

With this point in mind it is wise to start about three months earlier, or at the age of six months, to accustom the infant's digestive tract to starch. This may be done by the judicious use of barley water as a milk diluent.

Many babies can digest starch immediately after birth but it has been demonstrated beyond question that it is usually unwise to start starch diluents earlier than six months.

Barley water may be prepared from any of the barley flour preparations offered at the stores. A tablespoonful to the pint of water forms a strong barley water. In beginning the use of barley water the mixture should be only half this strength and in many feeding cases this strength should not be increased.

At nine months the baby may be offered a piece of dry toast or zwieback. This will be only slightly chewed at first but by the end of a month the baby will be eating a fairly good sized piece.

At ten months two tablespoonfuls of cream of wheat or farina may be offered. This should be given with milk but without sugar. The bread and zwieback may be continued. The cereal may be gradually increased until four tablespoonfuls in quantity is reached at one year. The total quantity of milk given each day is reduced as the cereal is increased.

When a baby is a year old the solid food should be rapidly increased. One experienced in baby clinics sees many infants that have been fed at the breast or on the bottle exclusively for eighteen months or even two years. When this has been done great difficulty is usually experienced in establishing a solid food diet as the appetite for solid food has been lost.

Milk should be limited to one quart in 24 hours when the baby is one year old. By this time undiluted milk is given. The diet at one year may be as follows:

7 a. m. Glass of milk and cereal (4 tablespoonfuls)

11 a. m. Glass of milk and toast or zwieback.



2 p. m. Glass of milk and cereal (4 tablespoonfuls)

6 p. m. Glass of milk and cereal (4 tablespoonfuls)

Note. Chicken soup or mutton broth may be substituted for the cereal at one feeding two or three times a week. Orange or prune juice should be continued, always offered between feedings.

Eggs and potatoes may be added to the diet at fifteen months. Eggs should always be coddled or soft boiled and at first not more than a teaspoonful should be offered. The amount may be gradually increased until the baby is getting a whole egg every other day.

Potato should always be mashed and plenty of milk added to it. All lumps should be pressed out as lumps will pass through the intestines undigested.

Meat is offered at two years. Beef, lamb and chicken are the only ones that should be given and these should be scraped or finely chopped.

At this age green vegetables, thoroughly cooked and mashed, may be offered. Vegetables to be given include beans, peas, asparagus, carrots, beets, spinach and celery. These may frequently be offered in the form of puree. In fact, a puree made of equal parts of spinach, carrots and beets, may often be a valuable food, given in small amounts, as early as one year.

Green fruits have no place in an infant's diet. They should never be offered under three years and then should be given between meals or an entire meal should be made of fruit alone.

Here is a list of foods that may be included in the diet of a baby at the age of 18 months:

Milk	Mutton broth	Barley jelly
Milk toast	Chicken broth	Oatmeal jelly
Butter	Cream of wheat	Rice
Zwieback	Farina	Orange juice
Toast	Hominy	Prune juice
Crackers	Beef juice	Baked apple
Potato (baked)	Eggs (soft boiled)	Stewed prunes
Corn starch	Cup custard	Stewed peaches

The following diet lists have worked out well with the writer:

#### **Diet for a Child from One Year to Fifteen Months**

6:00 A. M.	Milk, 8 ounces. Zwieback or biscuit. Dry or softened with warm milk.
9:30 A. M.	Saucer of farina or cream of wheat, very well cooked in double boiler. Cup of milk.
12:30 P. M.	Beef or chicken broth with toast crumbs. Juice pressed from very fresh beef, over baked or mashed potato.

- 4:30 P. M. Apple sauce or juice of orange.  
 6:00 P. M. Cup of junket.  
               Cup of milk.  
               Biscuit.

### **Diet for a Child from Fifteen to Eighteen Months**

- 6:00 A.M. Milk and crackers.  
 9:00 A. M. Prune juice, apple sauce or orange juice.  
 9:30 A. M. Saucer of hominy, farina or cream of wheat, very well cooked in double boiler. Cup of milk.  
 12 Noon Eight ounces of beef, lamb or chicken broth, thickened with farina, sago or home-made noodles.  
               Coddled egg, alternate days; steamed rice with beef juice, pressed from very fresh meat.  
               Apple sauce.  
 3:30 P. M. Cup of milk or malted milk.  
               Zwieback or biscuit.  
 6:00 P. M. Cup of custard, junket, or steamed rice.  
               Cup of milk.  
               Biscuit.

### **Diet for a Child from Eighteen Months to Three Years**

- 6:30 A. M. Orange juice, apple sauce or prune juice.  
 7:30 A. M. Warm milk, eight ounces.  
               Zwieback or cracker with butter.  
 11:00 A. M. Farina, hominy, cream of wheat, oatmeal, well cooked in double boiler. in addition, a cup of warm milk, six ounces.  
 2:00 P. M. A soup, a meat, a vegetable, and a cracker. Beef or chicken soup, thickened with split peas, sago, rice, or farina.  
               Clear broth, with yolk of egg, or one or more ounces of beef juice, pressed from very fresh meat.  
               Oyster or clam broth               Chicken jelly  
               Joint of chicken                Baked potato with butter  
               Broiled halibut                 Spinach, or carrots  
               Raw scraped steak  
 6:00 P. M. Crust of bread or zwieback. Warm milk, with white of egg or cocoa.  
               Junket, custard, corn starch, tapioca, or farina pudding.

### **DIETS FOR UNUSUAL CONDITIONS**

Children who have diarrhea, with fermenting stools, may be given the following special food for a few days:

**Liquid Flour Food:** Flour is boiled in water one hour, making a thin soup. To this is added an equal part of unboiled milk, a little salt, and the whole is strained through a very fine mesh sieve.

Bottles are filled with this, and kept on ice until needed. At first, the stools may be very sour, for one or two days, but this soon passes away since the fermentative bacteria seem unable to thrive on the flour mixture. Children may thrive on this mixture, with the addition of the vitamine-containing foods. One to four teaspoons of orange juice, mixed with a bottle of boiled water, and then strained through a very fine sieve or a cloth, provides the vitamins required during the first year, with cream. For children who have an intolerance to milk, or children who do not gain in weight; who do not have any gastrointestinal symptoms, Czerny recommends the following:

**Butter-flour mixture:** 40 grams of butter is placed in a pan and heated until it is light brown; 40 grams of flour is added to this, and well mixed and slightly cooked; 600 grams of boiling water is then added, a little at a time; then 400 grams of boiled milk and 20 grams of sugar are added and well mixed. This is strained and placed in bottles and kept on ice until needed. It must not be given to children with diarrhea or any other gastrointestinal symptoms. It often is well-handled, and the children gain in weight. It is a temporary diet, for a special purpose, and must not be made a permanent diet. It has been used as early as the third week of life.

**Goat's milk** is often advised. It is white, odorless and tasteless, if the animals are properly kept; if the milk is found to have an unpleasant odor, it is not fit for infant feeding. Goats are free from tuberculosis and are very cleanly animals. The milk often agrees excellently with babies who cannot take other foods. On the other hand, goat's milk is rather high in caprylic and caproic acids, and these do not agree with certain babies.

For supplemental feedings, in children for whom ordinary preparations do not seem adapted, try

**Sour cream** and milk, prepared as follows: Seven parts of cow's milk with 3.5% of cream, three parts of cream from fresh milk (secured by centrifugalization), and one or two spoonfuls of milk which has been soured by the action of the lactic acid bacillus; this is well stirred and left in a warm place for twenty-four hours, with frequent stirring. It is then warmed and beaten until the casein is beaten into a fine and smooth mass; the preparation looks very much like fresh milk. The lactose has been converted into lactic acid; the albumin is not changed. A little sugar may be added if this is desirable. Children sometimes thrive on this when other foods are impossible.

Thick cereal mixtures are useful in malnutrition, especially with vomiting, not due to pyloric stenosis or spasm, not in babies unable to swallow fairly well.

(1) 11 oz. skimmed milk, 7 oz. water, and 3 level tablespoonsful of farina boiled together for half an hour; to this are added 4 oz. of top milk from 1 quart of whole milk and one level tablespoonful of granulated sugar; 3 oz. of this mixture are fed every four hours, and 3 oz. of water every four hours, alternating.

(2) 15 oz. skimmed milk, 6 oz. water and 3 level tablespoonsful of farina are boiled as before; further methods as before.

(3) Oatmeal gruel, any of the wheat preparations, or barley gruel, may be employed, the amount used depending upon the thickness. The mixture should be thicker than heavy cream, and should be perfectly homogeneous; all such mixtures should be strained through a very fine mesh sieve.

These thick cereal foods may be fed with a spoon, or a larger hole may be made in the nipple of a nursing bottle. This food has given excellent results in several hospitals and nurseries. This food, like all other artificial foods, must be supplemented by juices containing vitamins.

Thick gruel feeding is very useful in all cases of persistent vomiting. Babies on artificial feeding may be given any formula containing cereals as a thick gruel, by diminishing the amount of water employed. The water required for metabolism is to be given at regular intervals between feedings. If the artificial formula does not contain cereal, two or three teaspoons of a thick gruel made of any of the usual cereals, or jellied preparation of oatmeal, rice, or other cereal, may be given just before feeding. This seems to coat the stomach with a soft, non-irritating layer and prevent the irritative action of the liquid food. Breast-fed babies may also be given this same mixture before nursing.

**Vitamins** must be provided when babies are upon artificial food, and must sometimes also be given to babies who are breast-fed. Orange juice, from one spoonful to the juice of a whole orange, may be given to babies from six weeks to two years in age. It should be greatly diluted for small babies, one part of orange juice to ten parts of boiled water; the mixture is made stronger with increasing age of the baby. Tomato juice may be used occasionally; the juice pressed from the chopped leaves of cabbage or carrots, preferably raw, may be used in the same way, for older babies.

**Alkalinization of food** is often carried to excess. Alkalinization destroys certain of the vitamins, and diminishes the value of others; if the food is alkalinized at all,—and this is rarely indicated,—great care must be taken to avoid excess.

#### PIRQUET'S FEEDING

The essential features are: (1) the use of the term "nem" to denote the "milk-nutrition-value" of one gram of human milk. This is the unit, and is used as the word "calorie" is used,—though of course the terms are not at all synonymous. (2) The amount of food required in twenty-four hours

is in proportion to the surface of the intestinal tract. (3) The surface of the intestinal tract is equal to the square of the sitting height of any individual. (4) It matters little what food is selected from any of the ordinary, wholesome foods, so long as it contains as many "nems" as the number secured by squaring the sitting height of the individual in centimeters, and provided further that the food contains not more than twenty per cent and not less than ten per cent of protein.

Pirquet uses other terms also, which at first are confusing but which simplify computation when their use becomes habitual. One of these terms is "siqua", that is, "sitting-height-squared".

For example, a child of one year may have a sitting height of 45 cm. Siqua then is 2025. Fractions are disregarded. Decimen siqua then equals 20 nems. Maximum food requirement is ten decimen siqua or 2000 nems; 7 decimen siqua is the optimum food requirement, or 1400 decimen siqua. 3 decimen siqua is the minimum food requirement, for a baby in bed and quiet; this, in the example, would be 600 nems. Since a nem equals the nutritive value of one gram of human milk, the feeding would be very simple if milk alone were used. But since other foods are also employed, as when sugar or cereal are added to the milk, or when cow's milk or goat's milk are used, there may be some difficulty in computation.

The American Relief Expedition, in Austria, has employed this system in estimating the nutritive requirements of 400,000 children in Austria, with good results.

The accuracy of the statement that the surface of the intestine equals the square of the sitting height has been called in question. Several postmortem estimates of the intestinal surface in children and in adults have given quite variable results.



## CHAPTER X

### VOMITING, COLIC, CONSTIPATION IN BABIES VOMITING

Under the term vomiting are discussed those conditions in which vomiting is the chief symptom.

There are four general types of vomiting: acute, chronic, recurrent and cyclic.

**ACUTE VOMITING:** (Synonyms: Acute gastric catarrh, gastric fever, acute dyspepsia, acute gastritis.)

This form occurs suddenly in an infant or child previously well, or in one suffering from a slight chronic gastric disturbance.

This is rare in breast fed infants but is common in artificially-fed infants and older children.

**Etiology:** Indigestible food, or food improperly given.

**Symptoms:** In addition to the vomiting, which is sudden in onset, there is frequently pain referred to the abdomen. In infants the thighs are flexed on the abdomen. Pulse and respiration are increased and the temperature may rise to 103 F. There is sharp, continuous crying. Convulsions frequently usher in an attack. Emesis may continue long after the stomach is emptied. Diarrhea may be present. Occasionally there are symptoms of meningitis. Hemiplegia and aphasia are sometimes present. Catarrhal jaundice may follow the vomiting.

**Diagnosis:** Differentiate at the onset from vomiting of scarlet fever, tonsillitis, meningitis, appendicitis, intussusception, strangulated hernia, cyclic vomiting.

**Prognosis:** Good; patient usually recovers in from one to three days.

**CHRONIC VOMITING:** (Synonyms: Chronic gastritis, gastric catarrh.)

This disease is frequently a continuation of an attack of acute vomiting.

**Etiology:** Lesions at the 4th and 5th dorsal segments are the pre-disposing cause of this condition. The writer has not seen a case of chronic vomiting in which lesion at one of these points was absent.

Improper food, eating at too frequent intervals, hurried mastication, improperly cooked or highly seasoned food and a diet unsuited to a child of a given age are all exciting causes.

**Symptoms:** The first vomiting is the contents of the stomach. This is followed by sour, bile-stained mucus, ending with a clear

sour smelling fluid. Vomiting follows the intake of food. The abdomen is tender and distended with gas. There is usually constipation, although diarrhea may be present. Skin eruptions are common. The tongue is coated and stomatitis is usually present. There is stationary weight or a loss in weight. The appetite is poor. Sleep is fretful. Headache is common. There is frequently a cough. Choleric movements and epileptiform seizures are sometimes seen. The children are undernourished, intractable and bear various ear-marks of ill health.

**Diagnosis:** Exclude organic diseases of lungs, kidneys, heart. Tuberculin tests are valuable in excluding tuberculosis.

**Prognosis:** Good under proper treatment and care.

**CYCLIC VOMITING:** This is a condition characterized by recurring, and periodic attacks of vomiting, found in children, between the ages of two and four, although it is sometimes seen in infancy.

**Etiology:** Clinical experience indicates that the direct cause of this condition is a lesion at the 8-9-or 10th dorsal segments. It is apparently a general derangement of nutrition. Usually the children are neurotic.

**Symptoms:** The attacks are preceded by general symptoms of digestive disturbance. The child is listless, fretful, constipated and lacks appetite. The odor of acetone is noticeable on the breath. The urine contains abundant acetone, indican and diacetic acid. The stools are foul of odor; diarrhea or constipation may be found. White stools not rarely precede the attack. The vomiting appears suddenly on the taking of food or drink. It soon becomes constant and is accompanied by violent distress. The vomited matter is frothy, acid in reaction and may be streaked with blood. The pulse is rapid, weak and irregular. The temperature does not usually rise. Exhaustion is almost immediate and in a few hours the child is in a semi-conscious condition. In babies the fontanelle is depressed. The abdomen in all sufferers is retracted and flabby. The attack may continue for twenty-four hours, after which the child gradually recovers. The attacks occur at intervals of from a week to several months.

**Diagnosis:** Meningitis, kidney disease and acute indigestion, may be mistaken for cyclic vomiting.

**RECURRENT VOMITING** is caused by a lowered gastric tolerance, due to the continued use of formulae not suited to the given infant. This formula may not cause decided digestive symptoms but may be sufficiently incorrect to cause depletion of nutrition. The attacks may recur every week or every two or three weeks.

**Treatment:** Treatment varies according to the type of vomiting, the age of the child and whether, if an infant, it is bottle or breast-

fed. Clinical experience demonstrates that osteopathic lesions are the primary cause of these types of vomiting, except the acute and possibly the recurrent. Improper food is usually the exciting cause, although chronic and cyclic vomiting are seen in children who have been fed as correctly as possible. These cases, then, may trace their exciting cause to the disturbance of nutrition due to the mid and lower dorsal lesions.

**Acute Vomiting:** The treatment here is to stop all food and water for a few hours. Starvation should not be continued more than forty-eight hours. Mothers object to this, as the child suffers and if old enough pleads for water. If given, water is immediately ejected and recovery is delayed. The bowels should be promptly emptied by an enema of soapsuds or glycerine and water. The stomach may be washed out, in some cases, with satisfactory results. In this form of vomiting, the lesions are muscular, due to reflex irritation produced by improper food. Inhibitory treatment in the inter-scapular region following the above outlined procedures brings prompt relief. Do not use cathartics or sedatives. After a few hours food and water may be given. In infants under six months a good rule is to give two or three ounces of one third milk and two thirds water boiled together. This should be fed every three hours. In infants between six months and one year barley gruel may be given. This should be weak at first, one tablespoonful of barley flour to a pint of water. This may be given, two or three ounces, every three hours for 12 to 18 hours. Then one third milk and two thirds water, boiled together, should be started.

Treatment of breast-fed infants is like that of those fed on the bottle.

Older children may be given a tablespoon of clear bouillon, frequently repeated or a weak malted milk mixture. Return to the normal diet should be gradual.

**Chronic Vomiting** requires treatment appropriate to the age of the child. In the bottle-fed infant, these faults must be corrected: irregular feeding, under feeding, over feeding, too rapid feeding, too slow feeding, too long nipple, allowing baby to handle bottle alone, handling baby too soon after feeding, too tight belly-band, failure to allow air swallowed during nursing to be eructated before feeding is complete.

Some one of the food elements, fat, carbohydrate or proteid may be at fault. In those cases due to fats, the history usually shows a formula with a high cream content. In some of these cases it is necessary to use a formula of skimmed milk and water, without sugar. Dried milk has been used with success. As fat and sugar are interchangeable in an infant, the writer has used condensed milk in cases due to excessive fat and has had marked success with

it. The formula should be very weak at the beginning, the strength being increased gradually from day to day.

**Case Report:** Age, 3 months. Birth weight, 7 lbs. Present weight . 9 lbs. Vomits after each feeding and upon taking water. Vomiting began at 2 months, being infrequent, gradually increased until present condition was reached. Stools, constipated. Other symptoms; fretful, cries a great deal both day and night. Appetite poor. Loss in weight during past month.

Previous food, bottle fed since birth. During past month had been fed on milk 10 ounces, cream 1 ounce, water 25 ounces, sugar of milk 2 ounces. This formula was substituted, 2 teaspoonfuls condensed milk, 4 ounces boiled water.

Seven feedings per day at 3 hour intervals. Vomiting stopped at first feeding and did not return. Food increased by adding one half teaspoonful condensed milk every third day and increasing water until formula was: 4 teaspoonfuls condensed milk 5 ounces of boiled water. This formula was then changed to whole milk and water with cane sugar.

Malted milk is also a valuable food.

A study of the formula which has been fed, together with a careful examination of the stools should accurately determine whether carbohydrates or fat is at fault. The reduction or elimination of the element at fault generally gives favorable results.

Cases in which gruels have been given as diluents frequently respond favorably when the gruel is replaced by water.

Care must be exercised in eliminating sugar. If the reduction in weight is so rapid that collapse is imminent, sugar must be added to the formula even though it increases the vomiting. The three hour feeding interval is the most satisfactory in the average case. There are cases however, especially in the infants under six months of age, and in which there is marked emaciation, in which the 2 hour or 2 and one half hour intervals may be used with benefit. It is rarely necessary to use the four hour interval.

**Chronic Vomiting in Breast-fed infants** is usually due to errors in the mother's diet, errors in nursing rules or too rich milk. Occasionally organic causes may be at fault. For treatment of these errors the student is referred to the chapter on breast-feeding. In older children, correction of dietetic errors should be co-incident with the adjustment of osteopathic lesions.

The diet list should be given to the mother in writing. It is impossible to formulate a general diet list. Each case must be given the particular kinds of indicated food. Excessive carbohydrate intake is to be carefully avoided. The heaviest meal should be at midday. The evening meal should be taken at least one hour before retiring and should consist of a thin broth or milk, and crackers.



A tepid sponge bath, followed by a brisk rub with a turkish towel immediately on rising is of value.

Excitement should be removed as much as possible.

Washing out of the stomach may be indicated. This should not be done more than three times a week. In most cases it is better omitted.

**Cyclic Vomiting** demands the prompt adjustment of the 8-9 or 10th dorsal segments. This with regulated diet, play, sleep and exercise brings prompt and satisfactory results.

**Recurrent Vomiting**, like acute vomiting is due to improper food and the treatment is to correct the dietetic errors. There is no constant osteopathic lesion. Each case must be adjusted according to lesions presented.

### COLIC

Colic is a digestive disturbance, characterized by loud, continued crying. It is common in infants. It is not the trivial condition so commonly supposed.

**Etiology:** The causes of colic include osteopathic lesions, most frequently present at the fourth or fifth dorsal segments, too much food, too frequent feeding, too much carbohydrate, too much fat, insufficient dilution of milk, the wrong kind of food. Bands which are too tight and clothing which is too heavy may be responsible for persistent colic.

Colic is frequently present in the new born and is found at any time during the nursing period. It is particularly likely to occur in babies following a difficult labor and in these cases pronounced vertebral lesions are nearly always present. The adjustment of these lesions has halted many attacks of colic.

**Diagnosis.** The symptoms of colic include: distended abdomen, long, loud crying attacks, vomiting immediately after feeding, hiccoughs, slight convulsions, constipation, legs and thighs flexed with tension and sometimes difficult respiration.

The distension of the abdomen is due to gas and it may be either gastric, intestinal or both. This point may be determined by inspection, palpation and percussion. The location of the flatulence should be carefully determined as an enema given for gastric distension is useless, while gavage for gas in the intestines is a wholly unnecessary procedure.

The tendency to convulsions is often found in infants suffering from colic. Convulsions of this type are, however, rarely serious.

**The treatment** of colic is indicated by the cause. Clothing must be loosened. Osteopathic adjustment must be made with caution. In an acute attack the position of the baby should be changed. It may be placed on the abdomen or thrown gently across the shoulder



with the head hanging slightly downward. Gentle pressure in the mid-dorsal area applied in this position will cause belching of gas and thus bring relief. A towel should protect the clothing of the person holding the child as food is likely to be vomited with the gas. The lesion is usually best reduced by gentle traction.

A careful record of the formula and feeding habits should be made and all faults corrected. A formula weaker than one indicated for a baby of given age and weight should be used at first. In young infants it is well to begin with one third water and two thirds milk, without sugar. If curds are present the milk may be boiled.

Barley water and other starch diluents should not be used.

Hot packs to the abdomen often give prompt relief. A cloth dipped in hot, weak vinegar, placed on the abdomen and covered by a heavy towel is a good form of hot pack.

Enemas are very helpful in intestinal colic. They may be of plain water or oil may be used.

Large quantities of mucus are usually present in the stools. A water enema, followed by oil is of value.

Sedatives and various therapeutic preparations advertised as helpful in colic may temporarily reduce the pain of an attack but they have no permanent value and are likely to do harm.

In the intervals between attacks, osteopathic treatment should be given. Cervical lesions are frequently found, and these must be corrected carefully. The cervical muscles may be found contracted, and it may be necessary to employ methods of relaxation. In babies, this is usually quickly accomplished by the methods usually employed in the treatment of adults.

## CONSTIPATION

Constipation is a sluggish condition of the bowels, in which there is a lessened number of stools than normal and in which the stools are harder and drier than normal.

The number of stools in 24 hours varies in different infants and according to the diet. In breast-fed babies there should be two or three bowel movements each 24 hours. In artificially fed babies the number should be one or two.

Constipation is frequently referred to as a symptom. While this is true in those cases in which the condition is due to dietetic, constitutional or mechanical causes or drugging there are cases in which constipation is the primary disease, induced by well marked lesions.

Because of the fact that the etiology of constipation varies in artificially and breast-fed children, these two types will be discussed under separate heads.

### Constipation in Bottle-fed Babies

Constipation is frequently present in cases of difficult feeding and despite the most vigorous measures remains a disconcerting feature until the diet is finally and satisfactorily adjusted. When this condition is present, the daily or twice daily enema is the best resort.

**Etiology.** So many different factors enter into the cause of constipation that a logical classification is difficult to formulate. Broadly speaking there are two types of constipation; one with the basic anatomical lesion and the other due to dietetic errors, organic lesions, abuse of cathartics, acute infections and nutritional diseases.

Many of those cases which are attributed to extrinsic causes like dietetic errors, etc., may be logically classified under the head of anatomical abnormalities as the same lesions found in constipation are also found in the other conditions.

In a series of fifty cases of constipation a well marked lesion was demonstrated at the fifth dorsal segment. In 20 of these cases there were lower dorsal and lumbar lesions, which produced pelvic lesions. Ten of these cases exhibited pronounced digestive disturbances, which resisted dietetic treatment until the lesions were adjusted.

The conclusion to be drawn from this series is that the most important osteopathic etiological factor is the lesion at the fifth dorsal with lumbar lesions as concomitant factors.

Under dietetic causes may be mentioned too much fat, too much sugar, too little or too weak food, boiled milk, lack of exercise.

Organic lesions producing constipation include hemorrhoids, fissure of the anus, polypus, obstruction from pressure, abnormally long colon.

**Treatment.** The treatment consists, first of all, in the adjustment of the lesions at the fifth dorsal, lower dorsal, and lumbar segments.

Coupled with the adjustment there should be intelligent feeding, based upon an accurate diagnosis of the dietetic errors. Sugar, it must be remembered, is the most laxative element in the infant's diet, but given in wrong proportions it may produce constipation. The treatment here is to increase or decrease the sugar according to intelligent rules for feeding.

Fat constipation is usually found in those infants who are fed top milk mixtures. The practice of increasing the fat content of the formula to overcome constipation is happily being discontinued. This procedure is frowned upon by most writers. If too much fat is being fed the treatment is to put the child on whole milk, properly diluted.

Boiled milk frequently causes constipation, but the advantages of feeding boiled milk in certain diseased conditions so far offset the disadvantages of the constipation that the boiled milk should be continued until the dietetic error for which it is given is overcome. The daily enema relieves the constipation until such time as the boiled milk may be discontinued.

Cathartics should be avoided. Calomel should never be given. The habitual use of cathartics in any form cannot be too firmly condemned.

Organic lesions causing constipation require the indicated treatment.

Muscles of the abdomen frequently lose their tone in chronic constipation and attention must be directed to overcoming the condition. This may be due to the predisposing lesion, to lack of exercise or to digestive disturbances. Direct firm manipulation of the abdomen is indicated in every case. This may be applied just before retiring at night and the first thing in the morning.

Resistance movements are useful in strengthening the muscles of the abdomen, and thus, indirectly, of the intestines. The mother may be taught to give these daily. The feet are held in the hand, and are pushed toward the child's body, which yields, then returns the pressure. By slightly varying the direction of pressure, the different abdominal muscles may be brought into play.

The infant should be allowed full freedom of the lower limbs in the crib or on the bed each day for a period of at least half an hour.

Orange juice may be given after six months of age. In the beginning this should be given twice daily, half way between feedings, one teaspoonful at a time. This may be increased in quantity until the juice of half an orange is given twice daily. Scraped apple, prune juice and other fruit juices may be given in similar manner.

Suppositories should be used with great care. The soap stick is admissable. Glycerine suppositories should never be used. They produce atony of the lower bowel.

Enemas are preferably given just before bed time. The water should be hot. The soap suds enema is best for general use. When stools are very hard or there is pronounced tenesmus an ounce of sweet oil may be injected at night.

Frequent stretching of the anus is useful. This should be done with the little finger, well covered with lubricant. The mother may be instructed how to do this daily.

In giving an enema the ordinary baby rectal syringe is usually sufficient. At times the high enema (catheter for the colon tube) may be advantageous.

Mineral oil may be used with good effect in stubborn cases. One teaspoonful night and morning is sufficient.

Milk of magnesia is frequently used as an aid in digesting the curd of milk and this is of distinct advantage in constipation. When given with the food the milk of magnesia has a less harmful effect upon the intestinal canal. The magnesia should be put into each bottle. One teaspoonful every 24 hours is sufficient dosage and should be divided equally among the bottles. The magnesia should be reduced in quantity as rapidly as possible.

Oatmeal water or oatmeal jelly may be given in the place of barley water in selected cases.

Habitual evacuation of the bowels should be taught early. The baby should be placed on the chair at a regular period each day. A well oiled finger may be inserted in the rectum at this time or a soap suppository may be used. This will quickly establish the habit of evacuation. As soon as the habit is established the soap stick or any other aid should be discontinued.

### Constipation in the Breast-fed

The causes of constipation in breast-fed babies include:

Improper nursing habits (irregular feeding, too frequent nursing)

Insufficiency of breast milk.

Lack of exercise.

Constipation in mother.

Cathartics.

**Treatment:** Correct faults of nursing.

If breast milk is insufficient, institute mixed feeding.

Discontinue cathartics.

If mother is constipated, correct such lesions as exist in her spine. Recommend coarser foods, including oatmeal, bran bread, nut bread, vegetables and fruit. Apples, prunes, pears, oranges, peaches and plums, four or five a day, are the best fruits. They can be eaten with or between meals.



## CHAPTER XI

### FUNCTIONAL DISORDERS IN EARLY CHILDHOOD ENURESIS

Enuresis is a functional disorder, characterized by frequent, involuntary micturition. Incontinence may occur while the victim is awake or asleep.

This disorder is found with the same frequency in boys and girls. Environment plays no part in its cause, unless environment may be said to be a factor in endocrine dysfunction; such dysfunction probably playing a large part in many cases of enuresis.

Micturition in the newborn is involuntary and control is not gained by the child until there is more complete brain development. When incontinence continues after two and one half years of age, the condition should be diagnosed as enuresis.

Enuresis is most common between the ages of five and eight. It rarely begins after the ninth year and rarely continues after puberty. It is not a serious condition but is one causing great annoyance. It is one of the most difficult of the minor disorders of childhood to successfully treat.

**The etiology** of enuresis is obscure. The children are usually neurotic, although those of phlegmatic temperament may be effected. The urine is, in most cases, normal. The condition of the urine probably plays no part whatever in the cause.

Spectacular success in the treatment of some of these cases and absolute failure in others led the writer to seek a reason for the apparently contradictory results. This he believes is to be found in the endocrines. While definite knowledge of the part played in the endocrines in enuresis is lacking yet it has been demonstrated that children suffering from certain types of endocrine dysfunction are not amenable to osteopathic adjustment.

The nervous centers controlling the relaxation of the sphincter and the contraction of the bladder are in the lumbar cord and it is here that we naturally look for osteopathic lesions. The fifth lumbar is most frequently found in lesion, although this is usually accompanied by a sacro-iliac abnormality. The writer has seen several cases of enuresis stopped entirely by the simple adjustment of the ninth left rib. On the other hand the adjustment of these lesions has failed in many cases.

It is the writer's opinion that cases in which there are pronounced evidences of endocrine dysfunction the prognosis should be very guarded. In fact at the present time it is doubtful if any treatment will help until after the endocrine changes of puberty have taken place.



Enuresis is found in two directly opposite types of children. The writer's experience in these two types has been unsatisfactory. Each type presents evidence of endocrine dysfunction.

First, there is the over-grown, over developed boy or girl, phlegmatic in temperament, slow in mental work, a laggard at play. This type of child wets when awake or asleep. The trouble may cause some shame but in most cases of this type the sufferer pays little attention to it.

The second type is the highly strung, nervous child, mentally alert to the point of being precocious. This type is sleepless at night, has night terrors, is subject to habit spasms and headaches. It seems almost impossible for the child to gain in weight. The physical activity is intense. The growth in height is rapid but there is no compensatory deposit of fat or growth in tissue. The result is a scrawny, lanky child. Enuresis causes this type of child acute suffering from shame. The incontinence occurs day or night.

The writer's experience has caused him to tell parents of children of either of these types that there is little hope of correcting enuresis until after puberty, at which time it will disappear naturally.

**Treatment** of enuresis osteopathically should be directed to the fifth lumbar, sacro-iliac articulations and to the ninth left rib. In the neurotic types attention should be directed to these symptoms and their causes.

Worms should not be overlooked.

The dietetic treatment of these cases is important. There should be a prompt and marked reduction in the intake of sugars and starches. Cane or beet sugar should be replaced with dextri-maltose. Milk is an excellent food and should be given in quantities up to a quart a day. Tea and coffee should be denied.

Many measures such as applying silver nitrate to the urethra, passing a sound and dilating the rectum are recommended. These measures are unwise in most cases because they usually fail. They should be tried only as a last resort.

Circumcision has been recommended as a help. It may be of benefit in some cases but like the removal of adenoids, which has also been lauded as a cure for enuresis, it usually fails to produce results. The writer has seen more cases of enuresis in Jewish boys than in any other race.

There is a tradition that water should not be given to a child suffering from enuresis late in the afternoon or evening. It is the writer's experience that it makes no difference whatsoever when water is given. Let the child drink when thirsty. The intake of water has nothing to do with the cause of enuresis and the child will wet the bed at night regardless of whether water is taken in the afternoon.

The school habits of a child suffering from enuresis should be given attention. The teacher should be informed of the trouble so that the child be not denied the right to leave the room when necessary. Wetting the clothing at school causes acute shame in many cases, thus increasing nervous reactions.

### BREATH HOLDING

Breath holding is a common and, to parents, a somewhat terrorizing condition. It is found in neuropathic, ill tempered, irritable children. It is of no serious import and is a symptom of the underlying nervous condition.

The attacks usually follow a spasm of rage. The child cries lustily for a time, then suddenly stops and becomes pale or cyanotic. The body twists and turns at first but soon becomes rigid and the eyes become fixed. Apparently the child is on the verge of asphyxiation but the attack speedily disappears and the child becomes normal. The attack rarely lasts longer than a few seconds.

These attacks must be differentiated from minor epileptic seizures. Breath holding comes on only after rage, excitement or crying. while in epilepsy the attacks occur at any time; while the child is at play, is quiet, or even asleep. Evacuation of the bladder and rectum occurs in either condition. The tongue is not bitten in breath holding but may be in epileptic seizures. A long sleep may follow either type of an attack. At times breath holding is followed by convulsions.

In an acute attack a glass of cold water thrown in the face of the child usually terminates the seizure. The parents should be cautioned not to permit undue excitement. Regular hours of rest and play are essential. The diet should be carefully regulated, particular attention being paid to reduce the carbohydrate content. Ice cream should be withheld from these children.

Parents should be cautioned not to humor these children. Punishments increase the neurosis and predispose to further nervous disturbances. It is true that threats and punishments cause cessation of the attacks, but the emotional repressions thus engendered may result in serious neuroses a few years later.

To refuse to take them seriously, assuming the attitude that the child may do as he pleases in the way of breathing, but that his methods of breathing are not to modify the judgments or the actions of the parent or nurse, is the logical attitude.

In the intervals between the attacks, the neurotic condition should receive attention. Lesions affecting the circulation through the thyroid and the pelvic organs have been reported. Lesions of the cervical vertebrae are occasionally present. In some cases there is reason to believe that a small cerebral hemorrhage in an obscure brain area, may be responsible for the neurosis. Treatments which

bring normal circulatory conditions of the brain, and of the viscera, may help to bring normal nervous function.

Such children often require more than the usual amount of muscular exercise. They should spend much time in the open air, and should be given plenty of exercise. If the nurse is neurotic she should be dismissed; if the mother or the father should be neurotic, the child should be protected from the nervous strain of such influences to as great an extent as possible. A neurotic mother cannot rationally blame her neurotic child, but she usually does so very severely.

## FEVER

Fever accompanies most of the minor ailments as well as the serious diseases of infancy and childhood. Temperature rises quickly to 104 or 105 degrees F and frequently this rapid rise may be without serious import.

In many cases temperature rises so rapidly and subsides so quickly that it is impossible to make a diagnosis. In other cases the temperature may continue for days or may be recurrent. Diagnosis in many of these cases is difficult and in some it seems at times to be impossible. Diligent care should be exercised as long continued or recurrent fever is always serious.

Temperature in infants must be taken in the rectum. It is impossible to take it in the mouth and the axilla and groin are un-reliable.

The nervous element in the cause and maintainence of fever in children is often overlooked. In neuropathic children a rise in temperature occurs in slight disturbances and is likely to continue longer than in children of the phlegmatic type. This should be remembered when osteopathic adjustments are made. The more neurotic the child, the more gentle should be the adjustment and the more quiet the surroundings. Nervousness should not be regarded as a cause of fever but as a contributing factor.

Never neglect to take a child's temperature when first called. Always disinfect your thermometer.

In summer the cause of temperature is most likely to be found in the digestive tract; in winter the cause is likely to be in the respiratory tract.

Despite many opinions to the contrary the writer believes that teething causes a rise in temperature. Swollen gums at teething time accompanied by even slight digestive disturbance may be responsible for fever.

Acute infections are accompanied by fever. Remember that there is an incubation stage in the exanthemata. Therefore, in acute fever, always question carefully to determine whether the child has been playing with other children, who may have an infection. If

members of the family have severe colds, bronchitis or other inflammatory ailments, it is more than likely that the child has the same thing.

Continued fever, without other serious symptoms, sometimes proves puzzling. It may continue for weeks or months, there being a slight rise in the evening to 99 or 100 F, or there may be an elevation throughout the entire 24 hours each day. Probably many of these cases are undetected and the child eventually gets well. This condition is usually present in neurotic children and is accompanied by digestive disturbances so slight that they escape attention. Slight constipation and failure to normally gain in weight are usually present.

It would seem from this that a change in diet and a thorough cleaning out of the intestinal tract would eliminate the trouble but unfortunately such treatment often fails.

In these cases, there are invariably found spinal and rib lesions in the mid-dorsal area. These lesions cause a lowered vitality. The writer believes that the temperature is due to the absorption of toxins from the intestines extending over a long period of time. Clinically, cases of fever of this type respond promptly to the adjustment of lesions, when accompanied by a correct diet and an intestinal cleansing.

In continued fevers one must be certain that there is no general blood infection (septicemia). Blood tests should invariably be made.

There are certain signs in fever which may help in diagnosis. These symptoms include:

Heart: Murmur, rapid respiration, rapid pulse, air hunger, pain in chest.

Lungs: Cough, expiratory moan, rapid respiration.

Urinary tract: Pus in the urine.

Alimentary tract: Diarrhea.

Appendix: Pain, tenderness and rigidity of abdominal muscles.

Meninges: Rigidity of neck, ocular disturbances.

Typhoid: Enlarged spleen, rose spots, temperature curve (markedly changed under osteopathic adjustment) blood test.

In every case of obscure fever the nose and throat should be carefully examined. Never neglect the ears. Infection of the middle ear causes many cases of fever. Pyelitis and cystitis are often overlooked. Urinalysis often tells the story.

Malaria is common in many parts of the country. Plasmodia in the blood confirms the diagnosis.

There is always a lurking fear of tuberculosis in continued or recurrent fever.



Fever that recurs at intervals without apparent cause is common. It usually comes on suddenly and may reach 104 or 105 F. It lasts three or four days, subsides, only to reappear two or three weeks later. This course may continue a year.

There are few symptoms. Sometimes there is headache and vomiting. Constipation is usually present. Physical signs are absent.

It is impossible to reach a diagnosis in the first attack. The vomiting and headache cause some concern but as they soon disappear no further attention is paid to the child until the next attack.

The treatment of these cases is difficult. Before anything definite can be done all possible causes of fever must be investigated and eliminated. If physical signs are absent, and the orifices of the body give negative information and laboratory analyses fail to yield information, only one course is to be followed.

Osteopathic lesions are always present. The entire bony structure must be aligned, frequently and gently. It is impossible to point to one lesion and say: "Here is the cause, adjust."

The neurotic tendency must be kept in mind and the intestinal tract must be thoroughly cleaned out and kept clean. Enemas best accomplish this. The high enema is unnecessary.

Rest, fresh air, pleasant surroundings and good nursing are essential. No attempt should be made in the beginning to increase the child's weight. The diet should be restricted. Usually the feeding history shows an excess in starches. Restrict the starches. Feed orange juice only for 24 hours. Follow this with milk every two hours during the next 24 hours. Gradually add solid food, with the starches reduced.



## PART II. DISEASES OF THE DIGESTIVE TRACT

### CHAPTER XII

#### DISEASES OF THE MOUTH

The mouth is subject to trauma and to infections. Lesions of the mandible, clavicle and cervical vertebrae, and the upper ribs, predispose to circulatory disturbances, diminish immunity to infections, and delay or prevent recovery. The child who has proper attention rarely suffers from any disease, and this statement is especially true of the diseases of the mouth. For the abnormal conditions of the mouth associated with the various infectious or constitutional diseases, see chapters devoted to these, as they are mentioned in the index.

**Herpes labialis** or "cold sore" is often associated with acute febrile conditions. It may occur in poorly nourished children spontaneously. There first appears a small group of vesicles; these break and crusts form; sometimes fissures may follow. The sores heal readily if they are permitted to do so. The child often picks at the lips with the fingers or licks them with the tongue, so that healing is greatly delayed.

The hands should be kept secured at night; sometimes during the day, so that the injury is prevented. Mailing tubes, covered with cotton or wrapped in soft cloth, may be placed over the child's arms in such a manner as to permit every movement except sufficient bending of the elbow to permit the hands to reach the child's mouth. The abraded skin of the "sore" may be powdered with some soft, non-medicated powder, if desirable, but this is not often necessary.

**Eczema** of the lips may be very painful. The red areas are fissured and dry, and may bleed freely. The trouble is worse in cold weather. Some soft non-medicated ointment gives much relief. Protection from dry cold air, and from irritating gas is necessary. For the treatment, see Eczema.

**Perleche** is a peculiar form of ulcer which occurs at the corner of the mouth. It begins as a small fissure, and there is a marked tendency on the part of the child to lick it,—whence the name. The irritation and the unavoidable infection causes a small grayish indolent ulcer, somewhat resembling the mucous patch of syphilis. It may persist from two to four weeks.

**Glossitis** is rare in children, except as the result of trauma. A broken tooth, or rough nipple, or cutting by teeth, as the result of a fall, are a few of the causes. Excessive heat, corrosives or insect stings may cause glossitis. The wounds are practically always infected, and thus become inflamed, and the tongue becomes stiff,

swollen and painful. The pain may be relieved by bits of ice kept in the mouth, or by the use of soothing, mildly alkaline drinks or gargles. The disturbance usually persists a few hours, or possibly two days or so.

**Ranula** is a retention cyst beneath the tongue. It is easily opened, and a glairy fluid escapes. If it refills, the walls should be cauterized, or else they should be so generously excised that the remaining portions of the walls adhere and destroy the cyst completely.

**Ulcer of the frenum** results from injury to the frenum, usually as the result of spasmodic coughing, as in pertussis, and subsequent infection. The ulcer may be grayish, and may resemble a syphilitic ulcer. The history tells the diagnosis.

**Epithelial desquamation** of the tongue is a peculiar condition, probably congenital, in which the epithelium of the tongue first thickens, causing grayish elevated ridges, and then exfoliates in shreds, leaving reddened areas. These red areas develop new layers of epithelium, which passes through the same process. As various areas are thus undergoing different stages, the tongue presents an irregular surface, somewhat resembling a map. The name "geographical tongue" is applied to it, for this reason. It is not painful, or at most, slightly uncomfortable. It is not affected by digestive changes, and no adequate etiology has ever been suggested. No treatment is useful, and none is required, since there are no symptoms and no distress.

**Catarrhal stomatitis** may result from excessive heat, corrosives taken by accident or, more commonly, from any of the acute infectious diseases. The mouth is dry, red, swollen, and painful. There is increased secretion of saliva and mucin, so that the saliva may drip from mouth, although the surface appears dry and is hot. The tongue is usually coated. The acute infections may cause other pathological changes. The neighboring lymphatic nodes are often swollen and tender. Digestion is often disturbed; appetite is diminished. If the patient is an infant, it is restless and fretful, often seems hungry, but refuses to suckle or to take the bottle because of the pain. Older children refuse food, both on account of diminished appetite and on account of the painfulness due to mastication and swallowing.

**Aphthous stomatitis** (herpetic, maculo-fibrinous, vesicular, or follicular stomatitis) is associated with the symptoms of the catarrhal form, and is, by some authorities, considered merely a more severe form of the latter. It is characterized by the appearance, upon the inflamed membrane, of groups of vesicles, these show cellular proliferation and the accumulation of tiny amounts of liquid beneath. The superficial surface of each vesicle soon be-

comes eroded, and a whitish or yellowish area is left, resembling a very small ulcer, except that the surface is level with the surrounding membrane. Newly formed vesicles are surrounded by a red areola. Adjacent vesicles coalesce, forming patches of variable size. These are whitish, then yellowish, then grayish.

Constitutional symptoms are rather marked, and include fever, loss of appetite; digestive disturbances, such as vomiting and diarrhea; restlessness, and often the enlargement of the cervical lymph nodes.

The vesicles appear in successive crops, and the whole course of the disease may extend over two or three weeks, especially in delicate or neglected children.

**Ulcerative stomatitis** is also considered, by some authors, to be a further severity of the types already mentioned. The patches already mentioned undergo further development of the ulcerative process, so that true ulcers, with eroded edges and ugly gray surfaces are formed. The breath has foul odor; the mouth is very painful; the tongue is coated thickly and is usually swollen; the ulcerated areas are very painful and bleed easily.

Mild attacks may last a week or more; severe attacks may become chronic or may cause death from exhaustion and malnutrition, or the ulcers may become gangrenous and death result from that affection.

**Gangrenous stomatitis** (cancerum oris; noma) is rarely found except in institutions, and is not common anywhere. It seems to have been more prevalent before its infectious nature was recognized. Typhoid fever and measles often precede the development of the disease.

It begins as a dark spot, most commonly on the inner aspect of the cheek; sometimes upon lips or gums. A small ulcer, surrounded by an indurated area, shows a dark gray surface; this spreads rapidly, and produces a blackish, gangrenous area. The cheek is soon perforated, and the destructive process spreads very rapidly. The teeth, gums and tongue, the palate and, later, the opposite side of the face are involved.

There is little or no pain, and the symptoms are not marked at first; later there is marked debility; feeble pulse, delirium, diarrhea indicate the seriousness of the toxemia. Bronchopneumonia and pulmonary abscess commonly hasten the death of the child. Very rarely recovery occurs and leaves marked deformity.

**Pterygoid ulcer** (Bedner's apthae) is an ulcer found in infants, most often due to the use of too long a nipple. A small ulcer in the median line, or upon one side, or one upon each side, is found upon the hard palate. The ulcers are painful and may prevent nursing.

**Thrush** (sprue; soor; muguet; stomatitis mycosa; stomatitis hyphomycetica) is most common in infants of two or three months, or in poorly nourished infants of the first year. The disease is characterized by the appearance of whitish spots upon the tongue, lips, inner surface of the cheeks, or elsewhere in the mouth. These spots are due to the presence of a parasite, a mould fungus, whose exact nature has not yet been definitely settled. It is known to be one of the hyphomycetes; it was first supposed to be *oidium albicans*, later the *saccharomyces albicans*, and others have considered it to be *monila candida*. It grows readily in sugar solution or gelatine, and shows marked variation in form under cultivation. It is very often present in healthy mouths and in healthy stools, and hence its presence alone is not sufficient to cause the disease.

The infection is not often found in children who are well cared for, but this does occasionally occur.

It may spread to many other organs of the body, both by direct contiguity or through food and lymph and blood supply. Death may result from occlusion of the larynx or the esophagus.

The symptoms are not marked in mild cases; the infant refuses food and the mouth is painful and usually rather dry; digestion is disturbed, diarrhea is often present; the stools may be so irritating as to cause serious inflammation of the buttocks. Any malnutrition already present is made much worse by lack of food and toxemia.

The diagnosis is usually easy; microscopic examination of a scraping from the spots infected gives definite information as to the nature of the disease.

## TREATMENT

**Treatment.** In all forms of stomatitis there are certain underlying factors which are identical. The cause of the disease must be found and this removed. In nearly all cases the babies are bottle-fed, and there has been some carelessness about the care of the nipples or the bottles. Lack of asepsis and cleanliness is the most common cause; rough nipples, or nipples which are too long are also causes of irritation; but these are not apt to cause stomatitis unless some infectious agent is present also. Every possible source of infection and of irritation must be eliminated, if recovery is to be speedy and complete.

The mouth must be rinsed very gently and frequently. Boiled water, or boiled water with boracic acid may be used; the mouth should be washed before and after each nursing, and, in severe cases, may be rinsed at intervals of half an hour until the symptoms clear up to some extent.

Contracted muscles are usually found in the cervical and upper thoracic region. These must be relaxed with great gentleness; the ribs and clavicles must be raised gently, the arms should be moved



freely in every direction in order to free the tissues around the shoulder girdle, and to maintain correct structural relations of the tissues concerned in the circulation, innervation and lymphatic drainage of the face, mouth and the pharyngeal areas.

Rarely a child may be brought for treatment in whom ulcers and fissures are deep and refractory to ordinary methods of treatment. It may sometimes be necessary to cauterize such regions, but this is extremely rare in ordinary American families. Silver nitrate, carbolic acid followed by alcohol, burnt alum, are some of the more common agents. The cautery should be applied with extreme care, and should not be permitted to touch more than the limited area of the granulation tissue or the indolent or possibly gangrenous tissues. This should be followed by the treatment above outlined. It must be remembered that the healing power of a child's tissues are very much more marked than is the case with elderly patients, and that, given cleanliness and correct circulation and innervation, any injury or disease less than the destructive, is subjugated readily and, usually, completely.

There are certain constitutional disturbances which are frequently associated with stomatitis,—diarrhea, vomiting, fever, restlessness, and occasionally other symptoms. The relief of the local pain, the return to easy feeding and abundant drinking of water, may give relief also to the restlessness, vomiting and fever. The diarrhea usually yields to the increased cleanliness and sterilization of the food. For further treatment of the vomiting and the diarrhea, see the chapters on these subjects.

At the first appearance of stomatitis, in the bottle-fed baby, the usual food must be stopped, and boiled water, rice gruel or barley gruel given instead. After the mouth becomes fairly comfortable, some of the vitamin-containing juices should be given, greatly diluted with boiled water.

### MALFORMATIONS

Malformations and congenital abnormalities often affect the mouth. Macroglossia is rare and almost never exists alone. It is a diffuse lymphangioma. The tongue may become so large that it cannot be retained within the mouth and thus prevents nursing. The tongue may be enlarged in cretinism, acromegaly, and certain forms of idiocy.

The tongue may be absent or bifid.

Tongue-tie is a condition in which the frenulum is too short, making it impossible to move the tongue freely, or to protrude it beyond the lips. Rarely it may interfere with sucking.

Sublingual fibroma is a peculiar hyperplasia which forms beneath the tongue near or involving the frenulum; it seems to be due to irritation caused by sucking. The surface becomes ulcerated. The disease is also called sublingual granuloma; Riga's disease, and Fede's disease; it is most abundant in Italy; only one case is on record occurring in a baby of American descent, in this country.

Tumors are very rare upon the tongue; they include dermoids, angiomas and accessory thyroid masses.



Cleft palate and hare lip often co-exist. They are due to failure in development. Prognathism of the upper jaw may be developmental, or may result from the pacifier or from thumbsucking. Micrognathia most often affects the lower jaw. Exostoses may occur on either jaw. Odontomata result from the abnormal development of teeth in improper locations. Sarcomata are the most common malignancies. Congenital epulis occurs at the junction of the gum with the jaw; these are variable in type, and may be multiple. They are rarely very malignant, and do not recur on removal. Maxillary cysts of developmental origin are rarely found.

The uvula may be bifid, abnormally long or abnormally short; or it may show a congenital perforation. The long uvula may require surgical relief; the other conditions require no treatment.

## CHAPTER XIII

### TEETHING

(Dr. Whiting)

The healthy, well-fed baby usually has little or no difficulty in teething. Because the truth of this statement has not been recognized, many cases of disease in children have been overlooked; the mother or even the doctor has attributed symptoms to teething which were really due to serious organic disease. As is the case in puberty and the climacteric, physiological changes which occur during teething interfere to some extent with the ability of an individual to react efficiently to abnormal conditions. During teething, any cause of digestive disturbance is rather more apt to cause serious effects than would be the case either before or after dentition. While undoubtedly a thoroughly healthy baby cuts teeth as naturally and easily as he grows and develops in any other way, yet etiological factors ordinarily negligible may, during these days of eruption of the teeth, cause nervous or digestive symptoms of varying severity.

Two events seem to cause especial disturbance; the time when the tooth undergoes most rapid growth from the ramus, and the time when it perforates the membrane. Since the teeth erupt rather constantly during the first two years of life, it is readily seen that there could scarcely be a time of relief, if these occurrences alone were important causes of illness.

It must be remembered also that during this time many changes in the digestive secretions and also in the internal secretions are occurring; and also that during this time the central nervous system is undergoing rapid development; the child learns to walk and to talk and to adapt himself to the ways of those with whom he is associated. The latter is frequently a source of difficulty,—as is evident when the illogical and erratic and changeable manners of grown people in dealing with children are considered. It is no wonder that the second year of life is so often uncomfortable, even without blaming the teeth.

The developing tooth causes an atrophy of the over-lying bone, and by its growth penetrates it; then it pushes its way upward through the connective tissues, probably without causing much atrophy of these; it then reaches the mucous membrane, and this must be subjected to pressure-atrophy, and, possibly, also some digestive action. Rarely the membrane fails to undergo this normal atrophy; it may become thickened and hardened, and offer marked resistance to the penetration of the tooth.

The membrane contains very few sensory nerves, but when there is stomatitis, or when the tooth presses against an unyielding, overgrown epithelial layer, the pain may be marked.

**Difficult dentition**, in which the symptoms appear due to teething alone, and in which the symptoms disappear upon the eruption of the teeth, occurs in about one-third of children apparently healthy in other respects.

Feverishness is common. Rarely the temperature may exceed  $102^{\circ}$ , and in these cases there is probably some complicating factor.

Anorexia is common, and much less than the normal amount of food is taken. There is definite loss of appetite; it is not merely the pain of the mouth which prevents the taking of food; hence no attempt should be made to force feeding. Salivation and drooling are common; dry mouth is occasionally found. Catarrhal stomatitis is rather common. Eczema may occur; only when the condition clears up in the intervals of eruption can the eczema be held as due to teething alone.

Restlessness is common; vomiting occasional; diarrhea occasional, and constipation is rather more frequently found than diarrhea. Marked nervous symptoms, convulsions or insomnia nearly always indicate complicating factors; they must not be considered as due to teething alone, though they may be due to teething plus some unrecognized cause of neurosis.

**Treatment.** For all these conditions, the treatment is simple. Diarrhea, constipation, vomiting and restlessness are to be managed according to the directions given under those headings.

Food should be diminished or omitted altogether for several feedings; plenty of cool water should be given at frequent intervals. The water should be boiled, then cooled, and it may be shaken in the air or beaten with an egg-beater to restore its quality; utensils must be sterile if they are used for this purpose.

Very small bits of ice may be placed upon the baby's tongue. A larger piece of ice may be wrapped in gauze and rubbed over the gums or left for the baby to chew upon; the gauze must be so arranged as to prevent the ice being swallowed. Any cold, hard, comfortable, sterile object may be given the baby to chew upon, for relief. The finger, covered with gauze, may be rubbed over the gums, giving relief.

Osteopathic treatment is usually general in these cases. Reflexly contracted muscles are found in both the anterior and the posterior cervical groups, and in other spinal areas, according to the part of the intestinal tract involved. The ribs should be raised, the arm movements gently given, and attention given the clavicles and the mandible.

Laneing the gums is too often thought of at first. It is not often good practice, and should never be done except when the indica-

tions are absolute. When the symptoms are associated with the penetration of the tooth through the bone, lancing can do nothing but harm. The injured membrane may undergo hypertrophy; scar tissue may be formed, or the wound may become infected. The operation may not produce any of these abnormal results; in which case it has, at any rate, produced no good results.

When the tooth is almost at the membrane, but not quite ready to penetrate it, lancing does no good, and may do harm.

When the tooth is presenting at the membrane, which resists its passage, being thickened and swollen over the tooth, then lancing may relieve the condition speedily and no ill results follow. The lance itself must be perfectly sterile, and should be an instrument sharp only at its point. If an ordinary instrument be used, its sharp cutting edge should be protected by gauze or adhesive, so that no sudden movement may permit cutting the tongue or lips of the baby.

With the eruption of the tooth, if this is the sole offender, the symptoms are very speedily relieved. The fever drops quickly, though not by crisis; salivation diminishes; appetite returns; digestion becomes normal; restlessness disappears, the baby sleeps and acts as normal babies should.

When teething is difficult as the result of other causes, then the eruption of the tooth gives some relief, but the baby is not so suddenly and completely well. The underlying disorder persists, and its symptoms are usually intensified, so that it is not unusual for mothers to attribute the rickets or the infection to the difficulty in teething, whereas the previous disorder really had been responsible for the difficult dentition.

**Natal teeth** are rare. About one baby in 6,000 is born with one or more teeth. The teeth, usually the lower incisors, may be supernumerary. They may interfere with nursing, or may cut the upper gum, and require to be pulled. They are usually loose and easily removed. No later harm seems to result from their presence.

**Early dentition** occurs often in syphilitic children, but the condition occurs occasionally in non-syphilitics. Except for increased tendencies to digestive difficulties, no harm results from it.

**Delayed dentition** is more common. It is especially frequent in rachitic children, and in cretinoids.

**Irregularities** of the teeth themselves or of the order of their eruption are fairly common. Any of the infectious or constitutional diseases may be associated with early caries, abnormally large or small teeth, erosions, malpositions, variations in the relations of the upper and lower sets, and so on. Of these irregularities, some require no treatment, some are incurable, while some require the various dental operations devised for their correction.

**Alveolar abscess**, or gum boil, is most common in children whose teeth have been neglected. Following some slight abrasion, infection reaches the submucous connective tissue and an abscess develops around the root of a tooth. The pain is severe, and the side

of the face may be badly swollen. The pus usually discharges into the mouth, but may discharge upon the outer aspect of the face or into the antrum.

The treatment is that if any abscess; opening it when it points, draining and cleaning it, and the applications of heat (or cold) for the relief of the pain. Cleanliness of the mouth and teeth must be compelled, in order to prevent recurrence.

**Caries** of the teeth is far too common. It results most often from lack of proper cleanliness of the teeth and mouth. Rachitis, tuberculosis, rheumatism, anemia, mal-nutrition, in fact, any disease which lowers the nutrition of the body, predisposes to caries. The effects of eating excessive sweets have been overestimated, so far as the direct effects of the teeth are concerned, but the mal-nutrition due to improper diet is an efficient cause of lowered resistance, and thus of caries.

The pain due to caries may be responsible for many nervous symptoms. The absorption of the products of infection, the lowering of local and general immunity, the deficient mastication due to the disease of the teeth, are important factors in causing a number of other and apparently more important disorders of childhood.

The permanent teeth are apt to decay if the temporary teeth are carious. It is a question for the dentist to settle as to whether it is better, in any specific case, to cleanse and fill the affected tooth, or to remove it altogether.



## CHAPTER XIV

### DISEASES OF THE ESOPHAGUS

Diseases of the esophagus are rare, especially in children. **Malformations** are found in infancy, usually. They may be so severe as to cause very early death, or may be so slight as to remain unrecognized until autopsy. Branchial fistulæ are due to a failure of the branchial clefts to close; this may be complete, usually unilateral, or may be partial. The fistula may open upon the side of the face, either just above the sternoelavicular notch, or behind the jaw, in front of the eleido-mastoid muscle. The process from the esophagus may terminate in a blind pouch; this may form various cyst-like protuberances or may remain long unnoticed. Any cyst-like tumor appearing in this region is called "hygroma," whether it is due to aberrant closing of the branchial clefts or not. Diverticula are not very uncommon. They may or may not be congenital. Inflammation of a mediastinal lymph node may cause adhesions involving the esophageal wall; this causes slight impediment to the passage of food and drink; the esophagus just above the impediment becomes dilated, increasing as time passes; the distention of this dilated area, with gravity, causes a pouch-like diverticulum. The passage of a sound may be impossible; the sound entering the diverticulum. Roentgenological examinations, watching the drinking of a fluid containing barium sulphate, gives the diagnosis. Congenital dilatation is limited to the area just above the diaphragm.

Congenital absence and congenital stenosis of the esophagus are very rare. Very rarely the esophagus is doubled. Tracheo-esophageal fistulæ occur, also very rarely. The esophagus terminates as a blind pouch, rather dilated, at varying, but small distances below the larynx. The opening from the trachea enters another tube, and this passes downward as an esophagus, into the stomach. Food is swallowed into the blind pouch and immediately regurgitated. The sound enters the same pouch. Death usually occurs before a diagnosis can be made, in these malformations, when they are sufficient to cause any symptoms.

### ESOPHAGISMUS

**Esophagismus**, or spasm of the esophagus, is a spasm of the muscular coat; characterized by difficulty or pain on swallowing. It may be due to a lesion of the third to the tenth thoracic vertebrae, or of the fourth to the ninth ribs. It may be one part of a general neurotic complex, or may be hysterical. There may be no difficulty in swallowing certain types of food; one can swallow liquid but not solid food; another can swallow solids but not liquids. Hysterical subjects may be able to eat comfortably in a room alone, or to eat

only certain foods which they like; they may be unable to swallow those foods which they very especially do like, after having been refused them or scolded for over-indulgence.

**Diagnosis.** The sound can usually be passed readily; if not, the patient should be etherized and another attempt made, very carefully. In the hysterical type, uncomplicated, the sound passes very easily under anesthesia. True stenosis may be associated with hysterical symptoms.

The recognition of the bony lesions mentioned is easy; but the existence of lesions does not, of course, eliminate any other etiological factor. The neurotic child may suffer from any of the ordinary causes of dysphagia, as well as the healthy child.

**Treatment.** Correction of the lesions named is important, no matter what the exact diagnosis. Neurotic states must receive due attention, according to the directions given in the chapter on that subject. Hysterical children require careful discussion, under a modified method of psychoanalysis, adapted to their mental states.

### ESOPHAGITIS

**Esophagitis** may be acute, catarrhal, corrosive, chronic, diphtheritic, purulent, according to the etiological factors concerned and the amount of pathological change which occurs.

Acute esophagitis is probably always associated with the acute infections to some extent. It cannot be diagnosed during life, and requires no more than the usual treatment for the disease with which it is associated.

Catarrhal esophagitis is usually due to the presence of some foreign body, or to some irritating foods. Soreness and pain on swallowing are the most noticeable symptoms, and it usually disappears within a few days,—or even hours.

Corrosive esophagitis is due to swallowing corrosive liquids. Children may gain access to concentrated lye, strong acids or alkalis, and drink them. The extent of the injury depends upon the amount taken, the speed with which antidotes are given, and other facts. The pain is very severe, with spasms of the esophagus, great thirst, and varying constitutional symptoms. Shock may be fatal. Death may occur immediately or in a few hours. If the injury has not been fatal, recovery seems complete after a few days.

Stricture of the esophagus follows corrosive esophagitis or injury due to some foreign body. The injured area heals by granulation and cicatrization; the cicatrix contracts, and the esophagus shows a progressively diminishing lumen. Progressive dilatation by the passage of bougies is the treatment.

**Retroesophageal abscess**, periesophageal abscess and retroesophageal adenitis are all rare. These conditions are characterized by in-

spirational dyspnea, sometimes with spasmodic, nonproductive cough. The voice is usually not affected. Swallowing may not be difficult or painful. Swelling at the side of the neck is sometimes present, when the abscess is located rather high. This abscess resembles the retro-pharyngeal abscess in etiology, pathology and treatment.

Death results from pressure upon the vagus, in fatal cases. Asphyxia occurs suddenly, and death follows within a few minutes or hours.

## ABSCESS

**Retropharyngeal abscess** is a lymphadenitis, not a cellulitis. It is due to infection, and follows disease of other related tissues. Unusually it is due to the infectious agents in rhinitis or pharyngitis, occasionally it is due to the extension of a tubercular process from Pott's disease of the cervical spinal column. It is occasionally found in children previously in good health, but is much more common in delicate children.

A chain of small lymph nodes extends from the pharyngeal to the faucial tonsils, in children. This retropharyngeal ring of lymphatics becomes atrophied at about the third year. No doubt they are a part of the protective agencies of childhood, as is the case with lymphoid tissues generally; when the infectious organisms overcome their resistance, they break down and the retropharyngeal abscess results.

In the cases due to rhinitis or pharyngitis, any of the pyogenic or pathogenic bacteria may be present. Rarely it may follow any other of the acute infectious diseases of childhood. In the cases due to an extension of the infection in Pott's disease, the tubercle bacilli are present; these are often associated with any of the pyogenic bacteria.

**Symptoms.** The early symptoms are those of the primary infection; the veiled symptoms in Pott's disease, or the acute symptoms in rhinitis and pharyngitis. This acute attack may subside, and there may or may not be persistent low fever and symptoms of discomfort in the throat. In one to three weeks, the acute stage of abscess sets in rather suddenly. The temperature may reach 105°F.; constitutional symptoms suggest acute infection, and prostration may be very marked or may be rather slight. This condition lasts for some hours to a week; there is then noticed difficulty in breathing; fatal asphyxia may result immediately. More often it is sudden and frightening but not fatal.

Characteristic local symptoms are difficult respiration, noisy and often most marked on expiration; the head thrown backward or perhaps somewhat sidewise and backward; short cry, not often hoarse, and the dysphagia which may be so severe as to prevent any swallowing at all. Vomiting may occur, and this may increase the respiratory difficulty considerably. Occasionally none of these

characteristics are found, except the difficult respiration and the general discomfort.

These symptoms may suggest any one of several pharyngeal disorders. Palpation of the throat shows a mass obtruding itself onto the pharynx. The nature of the symptoms produced depends to a very marked extent upon the exact area of the pressure due to the abscess. It may push against the larynx, the trachea, or the esophagus most severely, and thus produce symptoms characteristic rather of the locality involved than of the abscess itself.

**Treatment.** When the diagnosis is made, only expectant treatment can be given until the abscess "points". The simple abscess does not burrow, and it is easily opened and drained. The tubercular abscess is much slower in development, may burrow a considerable distance, and is not easily and thoroughly drained. During the time before the abscess points, the throat may be rinsed often with hot mildly alkaline solutions, or normal salt or boracic acid solutions. The temperature should be as high as is comfortable.

The mouth gag should not be used; it may cause serious or even fatal asphyxia. When the abscess points, it should be opened immediately at that area. A bistoury may be used, wrapped in gauze or adhesive almost to its very tip, and sterilized. The throat should be washed in some mild aseptic solution. The nurse holds the child, well and firmly bound, with its head against her shoulder. The bistoury then opens the area of pointing, and the cut should be generous, one-half to an inch in length. The child's head then is quickly bent forward so the pus can drain into a pan. The operator then should investigate with his finger, and he may open the incision and break up adhesive bands within the cavity of the abscess. Holt uses a sharpened fingernail for the cutting, and then breaks up adhesions with a clean finger. Manipulation and pressing, gently, around the abscess hastens the evacuation of the pus. Inspiration of the pus is to be avoided, but it rarely occurs as the result of operation.

The further treatment is that of acute pharyngitis, except in tubercular cases, when the treatment should include also the usual treatment of tuberculosis.

If the abscess is not opened, it may break at any time; the pus be swallowed or expelled, and recovery ensue. Or it may open in the night and the child strangle; or the pus may be inspired into the lungs and fatal pneumonia result.

**Prognosis.** Recovery is usually fairly complete within a week, except in cases with Pott's disease. The cavity may refill, or another abscess appear, especially in frail and delicate children.

Rarely the abscess points upon the external surface; then the lancing should be done in that place. This is rather desirable, since it is much easier to prevent further infection of the external wound

than the internal. Especially in tubercular processes, in which the sinus is apt to remain open a long time, the external wound is greatly to be desired. If the abscess fails to point externally, however, it is better not to try to drain it upon the surface.



## CHAPTER XV

### DIGESTIVE DISEASES NOT ASSOCIATED WITH MARKED STRUCTURAL CHANGES

#### Normal Digestion in Infants

At birth a small amount of saliva, with very slight amylolytic power, is present. At three or four months, the ptyalin increases in amount and in functional power, but not until the second year is the amylolytic power of the saliva equal to that of the adult.

The capacity of the stomach during infancy is given by Holt as follows:

Birth .....	36 c.c. or 1.2 fl. oz.
2 weeks .....	45 c.c. or 1.5 fl. oz.
4 weeks .....	60 c.c. or 2. fl. oz.
6 weeks .....	68 c.c. or 2.27 fl. oz.
8 weeks .....	110 c.c. or 3.37 fl. oz.
10 weeks .....	128 c.c. or 4.25 fl. oz.
12 weeks .....	135 c.c. or 4.5 fl. oz.
6 months .....	180 c.c. or 6. fl. oz.
12 months .....	270 c.c. or 9. fl. oz.

These findings are averages; the exact size of babies' stomachs may vary according to the length of the body, and perhaps according to heredity. Most European pediatricians give figures considerably exceeding these for most ages, sometimes being double those given by Holt. After feeding, at birth, the stomach empties itself of human milk in an hour or an hour and one-half; and of cow's milk or other artificial food in about one hour longer. At six or eight months, about one hour longer is required. Food begins to leave the stomach almost as soon as the meal is begun. During sucking, a considerable amount of air is swallowed, so that the stomach is about half full of air at the end of a meal. This is often brought up, but if the baby lies upon the back, the air remains in the stomach. If it causes distress, lifting the baby causes belching.

Pepsin is present in gastric juice at all times after about the fourth month of intrauterine life. Hydrochloric acid is present only in very small amounts at birth; enough to provide for the activity of rennin and lipase, but not enough to permit activity of the pepsin. It seems very probable that the peptic digestion is either absent or very slight during infancy. The hydrochloric acid increases after birth. The exact identity of pepsin and rennin has not yet been determined; they may be one ferment with slightly varying activities. The total volume of gastric juice is large, probably almost or quite equal to the amount of milk ingested.

The intestines vary greatly in length; there seems to be no exact relation between body length and intestinal length. The small intestine is from five to nine times body length; the large intestine from less than body length to one and one-third times the body length. Unusually much greater variations are found. The remarkable thing is the length of sigmoid in the infant; it is often half as long as the colon.

The pancreatic juice acts upon all food elements, as in the adult. The intestinal juices and the bile appear to have the same functions as in the adult. The chemistry of digestion and the mechanism of absorption do not seem to vary during life.

The gastrointestinal tract is sterile at birth; bacteria gain entrance chiefly with food.

Digestion is an extremely complicated performance, even after the function has become completely established. During infancy the walls of the gastrointestinal tract are very delicate; the baby has the heavy task of adapting itself to a new world, and the complications associated with the processes of changing from nourishment by way of the placenta to nourishment by way of the mouth present many difficulties even when normal nursing is possible. When artificial food is forced upon this delicate tract, and the natural difficulties are increased by faulty mixtures of crude food materials, then the task is often too great for the digestive apparatus to meet, and symptoms of disease occur.

In later infancy and childhood, faulty food and improper methods of feeding, the demands of an artificial and often unfriendly environment, and the neurotic influences of civilized living all tend to lower the functional efficiency of the digestive processes, and encourage digestive perversions of various kinds.

Even when no mechanical obstruction is present, and when there is no recognizable pathogenic infection, digestion in children is often disturbed by faulty foods, faulty environmental changes, and the influences of those spinal abnormalities, due to slight injuries, at present understood only by osteopathic physicians. If the cause of the functional perversion persists for any considerable time, various structural disturbances result. Infections may follow the lowered immunity, and the child which at first suffered merely some form of indigestion due to the influences just mentioned, easily curable by the removal of the disturbing factors, ultimately is subject to chronic and perhaps permanent disability.

## BONY LESIONS

The place of vertebral and costal lesions in causing digestive disorders has been demonstrated by experimental work upon animals and by clinic evidence; there is no possible doubt as to the importance of these in etiology.

**Cervical lesions** may be caused in infancy by the "wobbling" of the baby's head, and in infants and in older children by careless handling, or by pillows improperly placed or too high, or by unbalanced muscular tension during hard crying, or by falls or strains.

Cervical lesions seem to affect digestion chiefly by way of the vagus. Vomiting, nausea, anorexia and occasionally constipation result from such lesions, and these symptoms disappear within a few hours or a few days after the lesions have been corrected.

Symptoms of some disturbance of the ductless glands often are associated with these symptoms, such as diminished blood pressure, atony of muscles, nervousness, and enlarged thyroid. These symptoms do not diminish as rapidly as do the digestive symptoms, but they also disappear after correction of the lesions, usually within a few weeks.

Irregular heart action is also a common accompaniment of the cervical lesion; the cardiac disturbance usually is relieved very quickly after the lesion is corrected.

**Thoracic lesions** have more marked effects. These are caused by faulty handling, by falls, and by wrenches or strains resulting from children's attempts at walking, playing, or fighting. An ill-fitting bed, or poorly fitting clothing, or shoes unequally worn, may also cause thoracic lesions. Children who carry books upon one hip, or carry babies, or who, being taller than their companions, bend the head downward, also cause varying degrees of slight, functional curvature of limited spinal areas; these also are lesions.

According to the location of the lesion, and according to the irritability of the different digestive viscera and the spinal nerve centers controlling them, symptoms of various digestive disorders are found,—vomiting, anorexia, diarrhea, constipation, intestinal toxemia, hepatic mal-functions of several types, and more complicated forms of mal-nutrition.

Such lesions may occasionally be found in children who present no recognizable symptoms; in such children questioning usually elicits some constant weakness,—tendency to constipation, or inability to eat certain normal foods, or some mal-nutrition. The occurrence of any further cause of disease,—infection, indigestible foods, etc., causes serious symptoms in these children. The lesion is, then, a predisposing cause of the disease in these cases.

Correction of the lesion results in improved nutrition, diminished severity of the effects of slight dietetic indiscretions, and increased immunity to infectious agents.

**Lumbar lesions**, often with lesions of the lower thoracic spinal column and the lower ribs, affect the liver, often causing slight and persistent jaundice; the lower areas of the small intestines, and the colon, sigmoid, rectum, and the sphincters. The lower the lesion, in

general, the lower the effects produced; but if any area is already somewhat inflamed, or is irritable for any reason, that area is more apt to be affected, even by lesions not directly associated with its governing centers.

**Diagnosis** of lesions as the sole cause of digestive disease is difficult. The lesion itself is recognized by palpation, and by the existence of hyper-sensitive areas in the immediate vicinity of the vertebrae which are found to be out of alignment. This is sufficient evidence of the existence of the lesion, and of its place at least as a complicating factor. Only by careful investigation can the lesion be considered the sole cause of the disorder, however. Sometimes it is only by correcting the lesion, and noting the disappearance of the symptoms, that the entire responsibility can be placed upon the lesion. Usually the use of drugs or of dietetic modifications adds to the severity of the symptoms before the child is brought for examination.

The history of the treatment given previously to the examination, and of a fall or other cause of lesion, may throw light upon these factors. Unfortunately, accidents are so often overlooked, and the use of certain drugs is so very common, that it is often difficult to secure a satisfactory history of the events of the child's life; this is especially true in digestive diseases.

Treatment of digestive disorders due to the lesion depends to some extent upon the nature of the lesion and its location and also upon the symptoms produced. Palliative measures are often necessary, and must be administered before the corrective treatment can be given, in many cases.

**Vomiting** due to the lesion can be relieved by giving as much hot water as can be taken until the stomach is fairly well cleaned; then giving bits of ice. The mother can do this, before the physician arrives, or before the child is taken to the office.

The child is then placed upon a treating table or a firm bed; steady pressure upon the tissues near the offending vertebra relieves the irritation and usually stops the vomiting, if still present. This is not to be done if the stomach is not yet fairly well emptied. The correction is then made according to the usual technique, except that the great delicacy of the tissues of a child must be considered in deciding upon the technical method.

**Diarrhea** is treated, first, by an enema to empty the lower bowel. This is given by the mother or nurse before the physician arrives. Careful examination may show definite lesions. Often the manner in which these have been caused can be elicited from the mother or the child by careful questioning. In other cases no definite lesion can be found, but there is an area of rigidity in the lower thoracic or upper lumbar spinal column. The child is then placed upon a table or firm bed, with the face downward or turned slightly to one



side. The physician then places his hand upon the spinal column over the centers most profoundly affected, and gives several quick, springing, forward manipulations. This stops the diarrhea if no irritating materials are within the intestine, and gives marked relief under any circumstances. The correction of the lesions is then to be made, according to the usual technique.

**Constipation** is first usually most promptly relieved by an enema. The correction of the lesion then permits return to normal function, though the relief is usually less prompt in constipation than in diarrhea. Massage of the abdomen is sometimes advised; it must be skillfully given, and even then is not always efficient. The unskilled punching of the abdomen by nurses or mothers is to be condemned.

**Prognosis** is excellent for complete recovery in all uncomplicated cases. If drugs or ill-devised dietetic measures or other irrational methods of treatment have been employed, the effects of these may delay recovery. If the lesion has been present any considerable time, its correction may be difficult, and the lesion may recur later. The child should be examined at proper intervals, in order that the lesion, if it recurs, may be corrected before symptoms appear, or before they have become severe, at any rate.

### NERVOUS DISTURBANCES

Neurotic children often suffer from digestive disturbances upon slight provocation. In such children some lesion may be responsible for the neurosis, and even when the neurotic condition is hereditary, a lesion may be responsible for the digestive symptoms.

**Rumination** is a habit occasionally contracted by babies who are just beginning to have the impulse to play. The pleasant taste of the food and the ease of bringing it back into the mouth, give the origin. Children sometimes become very expert, so that the food is brought up, played with by the tongue, and again swallowed without loss; the process may be many times repeated. Digestion and nutrition are somewhat impeded, but no marked symptoms are produced. Babies who do not receive attention, or whose natural movements are impeded, contract the habit more often than do those children whose normal play-impulses are permitted rational expression.

The only treatment necessary is to play with the baby, give him toys, and provide other interests for his attention.

**Nervous vomiting** is common in nervous children. Any cause of excitement, joy, grief, anger, even a sudden noise, or the arrival of unexpected guests, may cause sudden vomiting. The diagnosis is made by the fact that the vomiting is always precipitated by excitement, that the digested material is always composed of the food last eaten, and that it shows no evidences of indigestion. Cervical or mid-dorsal lesions may be found on examination; the nervous character of the child is evident.



**Treatment** depends upon the conditions as found at examination. Any one attack is terminated by the emptying of the stomach; perhaps some rest afterward is necessary. The lesions should be corrected. The cause of the nervous temperament must be found and, if possible, removed. The child should be protected from excitement at or near meal-time. Babies should be so protected, whether they show nervous symptoms or not. Larger children may be made to eat at a table alone, or in a room alone; this is often useful if a hysterical element is present. Such children are told that they may join the family at meal-time as soon as recovery is evident. No harm usually results from the vomiting, though emaciation may result if the performance is too frequently repeated.

**Nervous diarrhea** may occur in nervous children, or it may be found in babies or in older children who do not present signs of any especially marked neurosis. Bony lesions are usually present.

Symptoms are almost pathognomonic; the child suffers diarrhea at once after taking food. The stools show no evidences of indigestion; are perfectly normal in appearance, except that the amount of water is increased. One to six or more stools may be passed after each feeding-time. The condition is found in tiny babies as well as in older children.

Treatment depends upon the age of the child. The gentle springing movement already mentioned (page 109) may be given to any baby, no matter how young, as well as to older children. Lesions must be corrected, if present. The child should rest before and after eating; and any error in feeding, such as too long a nipple or too rapid eating, should be eliminated.

A bandage, broad, soft, warm, fairly firm but not at all tight, placed around the abdomen before eating, may give relief. The pressure of the mother's hand upon the abdomen during feeding may serve the same purpose. A small bag of warm water over the abdomen is of the same character, and is convenient.

If the child is nervous, the usual treatment for this condition is indicated.

## CHAPTER XVI

### DISEASES OF THE STOMACH ASSOCIATED WITH MARKED STRUCTURAL CHANGES

There is a very distinct line between the diseases of the stomach due to structural changes, and diseases due to abnormal function,—these, in turn, due to improper food or to bony or cartilaginous lesions.

The causes of the structural abnormalities are not yet well understood. Probably the congenital deformities are due to the same causes as are other developmental defects. Given any one structural perversion, functional perversions must follow. Functional perversions, in turn, produce structural disturbances, though these are very rarely marked, and they do disappear with the relief of the causes of the abnormal functioning.

#### CONTRACTION OF THE STOMACH

In cases in which insufficient food is taken, the stomach may become smaller than normal. Long-continued vomiting produces a similar effect. The diagnosis is rarely made, and the condition is found only at autopsy. The treatment of the contraction as such is not required, since the relief of the underlying cause, and the taking of a suitable amount of food, results in return to normal size.

#### DILATATION OF THE STOMACH

Slight degrees of chronic dilatation may be caused by too frequent feeding, by feeding too large amounts of food, and may be due to the weakening influences of lower rib lesions or middle and lower thoracic lesions. The feeding of food which is too greatly diluted may result in distension and weakening of the walls of the stomach through the mal-nutrition as well as the over-filling.

The greater degrees of dilatation, however, are due to obstruction of the pylorus, either the result of spasm or of stenosis.

The treatment depends upon the cause of the dilatation and the extent of the distension.

**Acute Dilatation** may occur during or after a surgical operation for any cause; during pneumonia or other infectious diseases, and very rarely acute and usually fatal dilatation occurs without any recognizable cause, in infants otherwise in fairly good health. Acute dilatation of the intestines usually accompanies the gastric accident.

**Diagnosis** is difficult when the disturbances complicate serious diseases, as pneumonia and enteritis, but usually the severity of the symptoms arouses immediate attention, and the diagnosis is earnestly sought.

**Treatment** includes brisk stimulation of the mid-thoracic region, raising the ribs, and abdominal massage, all gently but rather briskly administered. Washing the stomach and giving enemas of rather cool water, or normal salt solution, slightly alkalized, is useful.

**Prognosis** is doubtful. Severe cases are speedily fatal. Less severe attacks yield to treatment, but the injured gastric musculature may not regain normal strength for some months.

## PYLORIC SPASM

Pyloric spasm, or pylorospasm, presents certain superficial resemblances to congenital hypertrophic stenosis; the two conditions are, however, essentially very different.

**Etiology.** The causes of pyloric spasm are unrecognized, in most discussions of the subject. Lesions of the vertebrae, especially the seventh thoracic, are present in all cases under osteopathic supervision. The fifth to the eighth vertebrae and the corresponding ribs often show lesions. Muscular tension around the seventh cervical vertebral spine is present.

Other factors which may exacerbate the condition are indigestion, variations in the reaction of the gastric juice, malnutrition and nervous instability. These factors are themselves subject to the effects of the lesions, as just mentioned.

**Symptoms** resemble those of mild cases of stenosis, which perhaps accounts for the long-continued failure to distinguish between the conditions. Artificially-fed babies suffer more frequently, and the babies are very often irritable and restless. Vomiting is the first marked symptom; it may begin soon after birth, or not for several months. The vomiting may become projectile; the vomitus may or may not show evidences of partial digestion; changing the food may cause some improvement, but this is rarely permanent; the amount vomited rarely exceeds that of the last meal. Stools are diminished, but usually not very greatly, and some fecal residue is always present. Rarely there is visible peristalsis. The tumor may or may not be present; if it is present, it varies from time to time; varies under pressure, and may often be caused to disappear for a few minutes by steady pressure.

**Diagnosis** rests chiefly upon the symptoms and the findings on palpation. Roentgenological findings show retention of the food, but the occlusion is never complete in spasm; the stomach is not greatly dilated, if at all, and it completely empties itself in time. The duodenal catheter, of a size suitable to the age of the baby, can always be passed, though perhaps with some slight difficulty. The differential diagnosis between spasm and stenosis is given under "Congenital hypertrophic stenosis".

Indigestion rarely is associated with projectile vomiting, the vomitus shows abnormal conditions, visible peristalsis is not present; tumor is not palpable; the stomach begins to empty itself at a normal time, though the complete emptying may be delayed in indigestion.

Habitual vomiting is not projectile, constipation is not marked; the stomach empties itself normally; the vomiting is usually precipitated by handling the baby and rarely occurs without some such immediate cause.

Perhaps the most satisfactory diagnosis of spasm is found in the fact that, in every uncomplicated case, the osteopathic treatments result in speedy and permanent recovery.

**Treatment.** Most important is the correction of lesions as found, with very gentle manipulations. The ribs should be gently corrected; all handling must be done in a very easy and gentle manner; the baby must not be excited nor made to cry by the manipulations. If food is in the stomach, it is apt to be vomited; this is not invariably the case. No harm is done, in either event. Treatments should be given daily; two to ten treatments may be needed. After the condition seems normal, the child should be examined weekly for several months, in order to avoid recurrence.

Gastric lavage is rarely needed, but may be useful at first. It should not be repeated after the stomach is well cleaned.

Feeding intervals should be prolonged beyond the emptying time of the stomach, as shown by the X-ray plates. The amount given at each feeding must be varied according to each baby; increasing and decreasing the amount until the food is retained and digested without discomfort or ill symptoms.

Human milk is most desirable. If artificial foods must be used, they should be rather low in fat at first. Thick gruels may do much better than ordinary foods in some cases; the amount of water required should be given at intervening hours.

Alkaline lavage and alkalized foods have been often recommended in this condition. Cannon has shown that an acid solution on the gastric side of the valve, tends to relax the sphincter and permit the opening of the pylorus; on the duodenal side, an alkaline reaction facilitates the opening of the valve. For this reason, unless the analysis of the gastric juice shows marked increase in hydrochloric acid, the use of alkalized foods seems undesirable.

**Prognosis.** With correct osteopathic treatment and breast milk, the prognosis is excellent; with artificial food, properly planned, the prognosis is practically as good. Nutrition improves very speedily with correction of the lesions and relaxation of the pylorus, and within a few weeks the baby's weight and strength should be at the normal for its age. No later ill results are to be feared unless the lesions are permitted to recur.



## CARDIAC SPASM

### (Cardiospasm)

This is a spasmodic contraction of the circular fibers of the lower end of the esophagus, corresponding to pyloric spasm in some degree. Vomiting occurs immediately after food is taken, often with the first few swallowings. The food is swallowed again, and again brought into the mouth. The condition is differentiated from rumination in the fact that rumination is evidently pleasant; the nutrition of the baby is not affected; and swallowing is easy.

Etiology and treatment of cardiospasm are the same as in pyloric spasm.

## HYPERTROPHIC STENOSIS OF THE PYLORUS

Hypertrophic stenosis of the pylorus is a congenital hypertrophy of the circular muscle fibers of the pylorus, which closes the orifice either completely or partially.

It seems to be an exaggeration of a normal increase in these muscle fibers, and has been found in premature babies, and in fetuses examined after the death of the mother. The hypertrophy seems to increase after birth, and the stenosis is progressive. The stomach becomes dilated, sometimes very remarkably.

**Etiology.** The causes are unknown. No doubt some hypertrophy may be due to spasm of the pylorus, but the very different clinical course of the two disorders, and the fact that hypertrophy does occur during fetal life differentiates the two conditions in etiology almost completely.

Lesions are present both in stenosis and in spasm; the fifth to the seventh thoracic vertebrae, more commonly the seventh, are concerned. These seem to be of no etiological value in hypertrophy, and correction does not greatly affect the course of the disease.

**Symptoms.** Vomiting is the first symptom noted; it always appears during the first month of life, and may be noticed within a few days after birth. At first, this vomiting resembles that found in indigestion or in over-feeding, and follows feeding immediately. After a few days this vomiting becomes projectile in type, and does not follow each feeding, but several feedings may be retained and be vomited at once. It seems that the hypertrophy and dilatation of the stomach increase, hence the effects just noted. Changing food does not affect the vomiting, and breast-fed babies are not less subject to the disease than babies on artificial food.

Appetite is not affected; the babies are hungry and ready for more food immediately after vomiting. There is no evidence of indigestion.

Stools are very small and may be voided infrequently. This is not properly a constipation, since there is not retention, but the



small stool is due to lack of residue, and this is due to the fact that food does not reach the intestine. The stool may remain of the meconium character, and be composed chiefly of mucus, desquamated epithelium, and inspissated bile, with occasional small amounts of food-residue and abundant bacteria.

Loss of weight is marked; emaciation may be very profound; the skin seems dry, the face looks pinched, and all symptoms of starvation are present. In cases with partial stenosis, the symptoms may be less marked and the weight may remain stationary, or even increase, though much more slowly than in normal children.

A tumor is palpable midway between the ensiform and the umbilicus, a little to the right of the median line. Its position is not absolutely constant, but does not vary much in the same child at different times. The tumor is hard, about the size of a large olive or an adult thumb; it is usually somewhat elongated. It is usually felt most plainly just after vomiting, but may be more prominent just after feeding or just before feeding. Examinations should be made at different times.

Peristalsis is often visible; the waves usually disappear in the region of the tumor. They may be initiated by stroking the skin over the stomach with the fingers, or with a sponge wet in cold water or ice-water. The stomach seems ballooned, and the fullness over the stomach contrasts with the diminished size of the remainder of the abdomen. The intestines are less than normal in size, hence the flatness of the abdomen except over the stomach area.

**Diagnosis** rests upon the symptoms,—the character of the vomiting, the presence of the tumor, the loss of weight, the subnormal stools, and the X-ray examination, with such further investigations as may be required in unusual cases.

Three plates should be taken by the radiologist,—the first immediately after feeding the bismuth or barium meal, the second after two hours and the third after four hours. Normally some of the barium should be in the duodenum by the time the meal is finished, and should show in the first plate. The second plate shows the stomach almost or quite empty, when there is no obstruction. When stenosis is complete, the barium remains in the stomach until it is vomited, and none is found in the duodenum. In partial obstruction, very little barium reaches the duodenum within two hours, and some food remains in the stomach after four hours; the amounts varying according to the extent of the stenosis.

The stomach tube may be used to determine the emptying time of the stomach. A very soft rubber catheter attached to a glass bulb is used; or any one of several devices for the purpose. This avoids the slight delay caused by bismuth or barium in a meal, but it also may cause some irritation.

Dunn advises the use of the duodenal catheter. For this purpose an ordinary ureteral catheter is employed. The sizes suitable for different ages are as follows, French scale:

Birth to 2 months—13 or 14 F.

2 months to 6 months—15 or 16 F.

6 months to 12 months—17 or 18 F.

1 year to 2 years—18 to 22 F.

These catheters reach the duodenum and enter it easily in normal babies. Spasm of the pylorus may present some slight difficulty, but only slight, and the catheter of a size suitable for the age of the baby finally passes. In stenosis, either the catheter will not pass at all, or only one very much smaller than that suitable for the age of the child can be passed.

The differential diagnosis between hypertrophic stenosis and pyloric spasm is as follows:

### Stenosis

Vomiting in first month of life. Not severe at first. Soon becomes projectile.

Tumor may be palpated midway between ensiform and umbilicus.

Found in breast fed or bottle fed babies.

Not common.

No evidence of indigestion.

Great loss of weight.

Small sized stool, sometimes with no true feces.

Osteopathic treatments show little or no effects.

Dilatation common. Duodenal tube fails to pass.

### Spasm

Vomiting may start at birth, usually several weeks later.

Tumor may be present. Contracts and relaxes under pressure, or spontaneously.

Rare in breast fed babies.

Common.

No evidence of indigestion.

Loss of weight.

Small stool, always with some true feces.

Osteopathic treatments improve condition.

Dilatation rare. Duodenal tube passes easily, or with slight difficulty.

A few other rare diseases and malformations may offer difficulties in diagnosis. Atresia of the pylorus is evident soon after birth, and is quickly fatal. Stricture of the duodenum causes vomiting of bile. Pressure upon the pylorus by abnormally placed intestines, cecum and colon especially, has been reported; these conditions are very rare, and probably not to be diagnosed without operation. Partial stenosis of the esophagus, with dilation above the stenosis, may present difficulties; the X-ray makes the condition clear. These conditions, when the diagnosis cannot be made, are either incurable or are surgical, so that mistaken diagnosis of hypertrophic stenosis of the pylorus results in comparatively little harm to the baby.

The treatment is surgical, once the diagnosis of stenosis has been made. The Stone (Rammstedt) operation is at this time preferred.

The child is prepared as for any abdominal operation. The incision is made of the muscular layers only, leaving the mucous membranes intact. Afterward no food is given for four hours, though small amounts of water may be given after two hours. First breast milk and water, equal parts, then breast milk alone may be given, and after that the diet is that of any delicate infant.

The success of the operation depends upon the condition of the baby. If there has been a loss of no more than 10% of the baby's highest weight; if it has breast milk after the operation; if its vitality has not been depleted in any way, there should be no mortality, but only a steadfast and immediate improvement. But if there has been loss of weight greater than 20%, or if there is great exhaustion, or if it cannot have breast milk afterward, the percentages of mortality and of delayed convalescence are very greatly increased.

Rarely babies have recovered from what seemed to be hypertrophic stenosis under various methods of treatment,—thick food, dilatation by the daily use of the duodenal catheter, stomach washings two or more times each day, and other methods. But these are doubtful, at best, and require constant and skillful attendance. The surgical treatment is, at this time, preferable, and it should not be delayed after the diagnosis is fairly definite.

**The prognosis** is excellent if the baby's condition is good. If the condition has been allowed to go to emaciation and great weakness, the surgical measure may even then give excellent results.

### PEPTIC ULCER

Gastric ulcers are very rare in childhood. Disturbances in the circulation through the stomach and intestines has been shown to be an important cause of ulcers, and abnormalities of the secretions are also etiological factors. Both circulatory and secretory perversions are associated with spinal lesions, usually of the seventh and eighth thoracic vertebrae and the corresponding ribs. Rib lesions alone are occasionally found. Lesions of the tenth vertebrae and ribs are present in duodenal ulcer. Foreign bodies do not seem often of etiological importance.

Duodenal ulcers are much more common than gastric.

Ulcers in the new-born are rare, but do occur; their chief symptom is hematemesis. Persistent blood in the stools should suggest duodenal ulcer. Ulcerative gastritis is also rare. Thrush may reach the stomach and invade the membrane. Severe vomiting may so injure the tissues as to produce an ulcer; or may injure a small vessel, causing injury to the gastric wall. In the presence of any disturbance to the circulation, slight injury produces ulceration. Tuberculosis rarely invades the gastric or duodenal membranes, producing characteristic ulcerations.

Simple perforating ulcers, rather common in adult life, rarely occur in children; the etiology is unknown, except that disturbances of circulation are invariable. Perforation causes collapse, tympanites, death from shock, as in the adult form.

Diagnosis is difficult. The X-ray is the best method, but very few of the peptic ulcers in childhood are diagnosed before death.

Treatment is difficult. Lesions are to be corrected by the gentlest possible measures. Rest to the stomach is indicated. Rectal feeding may be necessary. In case of perforation, immediate surgery may save life; without this, death is practically inevitable.

### TUMORS

Cancer of the stomach is very rare in childhood. Sarcomata and adenomata are very rarely found. About ten cases of primary carcinoma of the stomach have been found in children. Rarely also, tumors, both benign and malignant, appear to be congenital.

## CHAPTER XVII

### DISTURBANCES OF DIETETIC ORIGIN

Improper feeding is an important cause of functional digestive disorders; in many cases bony lesions are concerned also, so that the improper feeding may be comparatively slight, and still seem to cause very serious consequences. If a child is improperly fed, it may still seem to be fairly well; if, then, a fall produces a bony lesion affecting the stomach, serious gastric symptoms may occur. If a child suffers from a bony lesion, he may still be fairly well; if, then, he eats food which varies only slightly from that which he is accustomed to, he may suffer equally serious gastric symptoms.

Over-eating, or the use of very improper food, or undue excitement during or immediately after eating, may cause acute gastritis; if these habits are continued, chronic gastritis occurs.

Indigestion from a relative or an actual excess of any one food element presents certain peculiarities. The most important factors of excess are four: water, fat, carbohydrate, and proteid. Mineral salts in proper combination, and vitamins, are important factors often lacking.

**Water excess** is due to excessive dilution of the food; usually in an infant fed with artificial foods who has suffered from some indigestion. The dilution of the food advised at that time is perpetuated by the over-careful mother beyond the time of apparent recovery. Occasionally the mother herself dilutes the food to an excessive extent, in the fear of over-feeding. The baby suffers from malnutrition; is nervous and sleepless; vomits frequently, usually immediately after feeding; diarrhea and constipation may alternate, or either may be constantly present. The stools are apt to be very hard in constipation, and very thin in diarrhea. The baby cries with hunger almost constantly. These symptoms may lead to further dilution of the food. Such babies recover rather rapidly when a food suitable to the age and weight is given. No further treatment is required.

**Protein over-feeding** is rare in infancy. The vomiting of large curds or the presence of large protein curds in the stool is more often an indication of the indigestion of the casein, most often cow's casein improperly modified, than it is an indication of an actual excess of protein in the food. The condition is recognized by the fact of excess in the food. Infants probably do not absorb an excess of protein, but the excess may cause putrefactive changes in the intestinal contents, and lead to the growth of an excessive number of the putrefactive bacteria in the bowels, with resulting toxemia and slight diarrhea. The stools in these cases are somewhat brown-



ish in color and of musty or foul odor; occasionally a peculiar stickiness is present also.

**Treatment** consists of diminishing the proportions of protein in the artificial food, perhaps with a corresponding increase in the sugar-content to provide for the diminished nutritive value. Dilution of human milk is best secured by giving the baby two or three spoonfuls of boiled water just before nursing.

**Carbohydrate over-feeding** may be due to excess of sugar or of starches. Infants may be given too high a proportion of sugar, or may be unable to utilize the particular form of sugar employed in the preparation of the food. Discomfort, not usually a sharp colic, occurs soon after food is taken,—occasionally even before nursing is completed. Regurgitation of small amounts of a thin, sourish, curdled liquid is frequent, and this may be so irritating as to redden the baby's lips and the skin around the mouth. The baby seems hungry frequently, and cries pitifully at intervals during day and night.

The stools are many, watery, green, sour, irritating; the skin around the anus and over the buttocks is often very seriously irritated, becoming sore and, later, eczematous. When the over-feeding is of maltose or starchy foods, the stools are browner in color at first, later becoming sour, greenish, and excoriating from the acidity. Fermentative processes occur in the intestines, and thus the acids become extremely abundant in the stools. The nutrition of the baby is seriously disturbed, and typical atrophy or marasmus may result, if the condition is not quickly relieved.

In older children the over-feeding may be either candy or starches. The munching of bread, crackers, or cookies between meals, the habit of buying candy, ice cream, soda, etc., between meals is a serious cause of malnutrition in this country. The mother very often either obscures the diagnosis or fails to recognize the great importance of this matter; it may be quite difficult to secure an accurate statement as to the actual amount of carbohydrate intake. Indirect questions may give the desired information. Worms are often suspected; the symptoms may suggest tuberculosis; parents may become so absolutely certain of one of these diagnoses as to refuse co-operation in any other diagnosis, or in any treatment based upon another diagnosis.

Babies or older children with excessive carbohydrate intake are pale; often fat, flabby, and soft; suffer abdominal pain due to the excess of gas, and the irritating nature of the intestinal contents; have diminished appetite, nausea, sometimes vomiting; the abdomen is prominent, especially above the umbilicus; bad breath, nervousness, and slight, annoying cough, are present.

Later loss of weight, soreness of the skin around the buttocks, poor teeth, coated tongue, severe diarrhea, and marasmus are found.

The condition is distinctly pre-tubercular, and these children often succumb to tubercular or other infections.

**Diagnosis** is made certain by the study of the food intake and the occurrence of the symptoms.

**Treatment** includes the removal of all carbohydrates from the food at first, and the diminution of these in the diet afterward.

**Fat over-feeding** is rather frequent. There is marked variation in different babies as to their power of utilization of the fats, and especially of the utilization of cow's fat or goat's fat. Breast fed babies may suffer from an excess of fat in the mother's milk, but this is less common than is the disorder in babies on artificial food.

Food too rich in fat may give merely the symptoms of over-feeding in general, at first. The baby seems very well early in the morning, because the amount of food given during the night is small. During the day he shows increasing discomfort, and in the late afternoon suffers and cries strenuously. Vomiting may give relief, but he seems very hungry, and if food is given he suffers in a similar manner again. The hunger is of a peculiarly ravenous type, resembling that of adult dyspepsia.

Excess of fat in the food delays the emptying time of the stomach, and permits the formation of fatty acids; these cause great discomfort, and irritate the walls of the entire gastrointestinal tract. The delayed emptying time is apt to cause vomiting, and this may be the sole symptom at first. The vomiting occurs some time after feeding; the vomitus is often irritating, with an odor of butyric acid. Curds may be present, and are small and soft, appearing quite normal. If vomiting is marked, the stools do not show an excess of fat, and seem normal. Loss of weight may or may not be marked during this time.

If the condition persists, the stools begin to show the effects of the fat excess; vomiting is usually less pronounced during this time; or this condition may, in other cases, exist from the beginning. The stools are rather large, whitish, glistening, and contain many fatty curds, in which the fat is made into a soap with calcium and magnesium. The loss of these salts from the body, in this form, is probably not of great importance. During this time there may be some loss of weight, or the child may only fail to gain normally.

If the condition persists, the stools begin to soften, on account of the fact that the fat is combined with sodium and potassium, forming a softer type of soap. Neutral fat may be abundant, or may not be found at all. Fatty acids may be present, in which case the odor is characteristic and the discharges irritating. Loss of weight is marked, and the symptoms more pronounced. If the fatty acids predominate for any length of time, the irritating quality becomes very serious and the skin around the anus may be eroded. The stools may become greenish, almost as in fermentative diarrhea.

If excess of fat is constantly given, or if the child's digestive secretions are unable to handle a proper amount of fat, a very serious problem is presented. The child is unable to gain weight, or to avoid losing weight, on a diet of carbohydrate and protein alone, yet when fat is added to the food for any length of time, serious symptoms develop. The addition of fat may, at first, seem to give excellent results; after a time an exacerbation of the condition occurs, and this may be fatal or extremely serious. These exacerbations, which Dunn calls "blow-ups", are characterized by toxic symptoms, high fever, or collapse and subnormal temperature, dyspnea, stupor or marked restlessness, acetone and diacetic acid and albumen in the urine, odor of acetone in the breath, and possibly fatal coma.

Infantile atrophy or marasmus frequently follow these disorders of fat-metabolism. This condition is discussed in a later chapter.

**Treatment** of this condition is often most difficult. In the early or the milder forms of the disorder, the fat of the food should be omitted for a time, and the carbohydrate content somewhat increased. After the symptoms have subsided, fat may again be added, very slowly and cautiously. If possible, human milk should be secured. If this is not possible, goat's milk, or mare's milk, or one of the albumen preparations with olive oil, may be given. Sometimes thick feeding can be used, with fat, when the usual thin preparations cannot be handled. Cereal combinations may be varied, and this occasionally so modifies the digestion that fat can be taken adequately.

In the more serious cases, every effort should be made to secure human milk, if only for one feeding each day. Goat's milk may serve excellently in some cases. Too great dilution of the food is to be avoided, if possible. Longer intervals between feedings are usually needful, since the emptying time of the stomach is increased in these cases.

**Spinal lesions** are usually present in all cases of food intolerance. These may be secondary in some cases, but undoubtedly are primary, and are responsible for the digestive inefficiency of the child in many cases. If the food being given the child seems properly planned, it is best, in all types of perversion, to give thorough treatment first, and to give barley water for two feedings, then to postpone changing the food for two days, or until it can be determined that the spinal lesion is, or is not, the essential factor in causing the digestive disturbance. If both improper feeding and the spinal lesion are present, and are active etiological factors, the dietetic directions given above should be given, and the bony lesions corrected as speedily as is practicable under the circumstances. When lesions are completely corrected, a gradual return to a diet normal for the age and size of the child can be given, and should be well handled.

Talbot and Brown report a series of cases in which faulty posture, with weak abdominal muscles and abdominal protrusion most marked below the umbilicus, seem to be responsible for many cases of constipation, recurrent vomiting and malnutrition in children. In this series, the children improved rapidly when they were given well-planned exercises and a temporary belt for abdominal support was placed upon the more seriously affected children. No doubt the osteopathic correction of the abnormal spinal conditions would have hastened recovery and have prevented recurrence.

**Prognosis** is very good in all functional digestive disorders, if rational treatment and dietetic corrections can be provided early. If unwise measures have been employed, until the nutrition of the child is seriously impaired and bad digestive conditions have become habitual, then the prognosis is doubtful and often serious.



## CHAPTER XVIII

### INTESTINAL DISEASES NOT ASSOCIATED WITH MARKED STRUCTURAL CHANGES

#### CONSTIPATION

This term is used in rather a loose manner. Properly speaking, constipation is the retention of fecal material beyond the normal time of passage. In this sense, conditions in which food is not taken, or when there is occlusion of the gastro-intestinal tract above the colon, are not characterized by constipation, but by absence of stools. Holt defines the term as applying to those conditions in which "the stools are less frequent and firmer than normal," and in further discussion applies the term to those conditions not characterized by total obstruction of the tract.

**Etiological factors** are many. Babies suffer from diarrhea more often than from constipation; after the age of three years, constipation is more often present. Several types of etiology are to be considered.

Bony lesions include many different spinal and costal conditions. Lesions of the cervical vertebrae, and of the first and second ribs, or the clavicle, affect the action of the vagus centers, and this may cause disturbances of the secretion of the digestive juices or of the activity of the muscles of the digestive tract. The more common effect of such lesions is a temporary diarrheal attack, followed by constipation. Lesions of the lower thoracic and upper lumbar vertebrae, most frequently a long and rather rigid curve to the right, result in atony of the walls of the ileum or the colon, according to the exact location of the lesion.

Anal abnormalities are often overlooked. A tight sphincter may result from lumbar or lumbo-sacral lesions; less commonly sacro-iliac lesions are found. Nervous children often suffer from the tight sphincters; whether as cause or effect, or whether a vicious cycle is present in these cases, is not easy to determine. Children who are punished for passing feces into diaper or drawers often refrain from going to stool, and thus, voluntarily or involuntarily, cause abnormal contraction of the sphincters; this may persist and contracture result. The spinal muscles and occasionally the gluteal muscles are unduly contracted in such cases.

In all cases of malnutrition, from whatever cause, atony of the muscular walls of the intestinal tract is common. Rickets, tuberculosis, marasmus, and the weakened condition which follows diarrheal attacks, are all associated with weakness of the intestinal muscles, and this is associated with constipation.



Dietetic causes are probably more common than the others mentioned. Infants may have diarrhea as the result of breast milk which is too low in solids, though this is rather rare. Infants on artificial food which is too low in solids, or too low in sugar or fat, or which is too high in fat, or which contains too much boiled cow's milk, often suffer from constipation. Older children whose food lacks vegetables, fruits, proteids or sugar often have constipation. Older children whose diet consists of an excess of milk, sweets and starchy food are always more or less constipated.

Habitual causes are less common in babies, but are often of etiological importance in children of the run-about age and older. Children interested in play, and those who have been punished for uncleanly habits, often delay going to stool, and thus defecation becomes more and more irregular and difficult.

Lack of water, and lack of vitamins, are two conditions very often overlooked. Water should be given very freely in all cases of constipation, whether in babies or in older children.

Vitamins are found in cream, vegetable juices, fruit juices, and meats. If the baby is receiving cream with the milk, and if the run-about and the older child are eating butter with other foods,—real butter, not substitutes,—then the fat-soluble vitamins are probably fairly abundant. Orange juice, the juice of raw or canned tomatoes, are well supplied with the water-soluble vitamins, and these may be given to babies six weeks old and older, if well diluted with water and given between feedings. Other fruits and vegetables are added to the diet after weaning.

**Symptoms** of constipation are surprisingly slight in children. Toxemia is rather rare, though it does occur. Flatulence and colicky pains occasionally occur. Attacks of diarrhea occasionally alternate with the usual longer state of constipation. The urine may be loaded with indican when no other symptoms of toxemia can be found.

The passage of the hardened scybala often causes discomfort or even severe pain. Hemorrhoids, hernia or anal protrusion may result from straining. Catarrh of the rectum and sigmoid are common; mucus and bloody streaks may be found upon the outside of the hardened fecal masses. Erosions of the skin and mucous membrane of the anal region are not rare.

**Treatment** of constipation depends upon the etiological factors present in any case. Correction of spinal or costal lesions should be secured with as slow and gentle manipulations as is possible. The sudden, springing manipulations mentioned in the treatment of diarrhea should be avoided, in constipation. At each treatment, gentle methods of increasing the mobility of the thoracic and lumbar spinal column, raising the ribs, especially over the liver, and increasing the respiratory intake for a few minutes, should be em-

ployed. Treatments should be given once each day until definite changes in the bony structures are secured; after that twice a week or once a week gives better results than more frequent attention. If the sphincters are tight relaxation should be secured, and dilation be given if necessary.

At first enemas should be used for temporary relief. Gentle relaxing manipulations of the anal tissues, with very gentle dilation of the anus should be given; preferably by the mother or nurse, if she is able to do this properly; it should be done half an hour or so before the usual time for defecation. Non-medicated suppositories of glycerine, vaseline, mild soap, etc., may be used in obstinate cases, but these are to be avoided if possible; if they are employed, it must be only for a very limited time.

**Training** is very important. In early infancy the use of the nursery chair at the time indicated by the first defecations may be begun. The baby fixes its own time for defecation during its first few weeks of life, and if it is placed upon the nursery chair or a chamber comfortably arranged, at this hour each day, regularity is soon established. If defecation does not occur at this proper time, a small oiled or vaselined glass rod may be inserted into the rectum, or the little finger, very clean and well lubricated, may be used for a very slight dilation. Very rarely it may be necessary to inject an ounce or two of warm normal salt solution into the rectum.

Older children should be taught to permit defecation at the first impulse thereto. Breakfast initiates peristalsis which continues to the colon; hence a short time after breakfast is usually the most physiological time for defecation. Children who go to school should eat breakfast at least an hour before time to start for school, in order that defecation may be well completed and that the urine resulting from the increased renal activity after a night's rest, and after breakfast and the drinking of water in the early morning, may be voided.

**Diet.** Infants rarely suffer from constipation; the addition of some of the maltose-containing foods usually gives immediate relief. Change from cow's milk to goat's milk is often advantageous. At about the time of weaning, an excess of milk must be avoided, and the fruits, vegetables and moderate amounts of cereals be given. Fruit juices, seraped apple, vegetable juices, all may be given to children from a few months of age upward. The juice from cooked prunes and figs is good; the pulp of prunes and the seeds of figs must be avoided in feeding small babies. A baby a year old can take the pulp of prunes or baked apples, but not the skin. Rough and irritating foods are to be avoided; seeds of berries and figs, or the skin of fruits such as pears, peaches, apples, etc., often cause increased bowel action at the expense of catarrhal inflammation and an exaggeration of existing causes of muscular weakness.

Honey and molasses may be added to the breakfasts of older children and these are usually enjoyed. The effects must be watched; flatulence may become worse and colicky pains produced by excess of these sugars.

### INCONTINENCE OF FECES

Children suffer from incontinence of feces occasionally as the result of congenitally weak sphincter; weakness of the sphincter due to continued constipation or to any other condition associated with the passage of large, hard stools; or as the result of a general neurosis. Abnormal states of the central nervous system, such as injury to the lumbar cord from accident or disease, spina bifida, meningitis, or any one of other less common affections, result in incontinence of both feces and urine, usually. Idiots may permit feces to pass; or they may suffer from true incontinence from the same causes which affect children with normal mentality.

**Treatment** must be determined with reference to the cause of the condition. Dilation of the sphincters may stimulate to greater strength, but if the regular passage of normal stools fails to secure adequate stimulation, it is improbable that artificial dilation will give good results; however, this may be tried. General constitutional conditions must receive attention.

Prognosis also depends upon the etiology; injuries to the spinal cord cause incurable incontinence; incontinence due to weakness of the sphincter may be outgrown, with increasing strength of the entire body.

### CHRONIC INTESTINAL INDIGESTION

#### (Coeliac Disease)

This term covers many conditions. Properly speaking, it should not be applied to those cases in which persistent faulty feeding causes persistent symptoms of indigestion, but to those numerous cases in which the child is chronically unable to handle the food normal to his age and size.

**Etiology.** The spinal column of such a child is almost invariably lordotic; and the amount of deformity is greater than the size of the abdomen accounts for. There is usually also a lateral curvature, though this is not often marked. The rigidity and the hypersensitiveness are more frequently marked at the upper limit of the curvature, though there may also be hypersensitiveness at the lower limit, or at the area of greatest deformity. These spinal lesions are responsible for the initial indigestion in many cases, and the persistence of the lesion results in the persistence of the muscular weakness and the disturbance of the innervation and circulation. With growth, the spinal curves either become corrected, or the abnormal relations undergo the various phases of adaptation.

so that by the fifth year, or thereabouts, the child is either outgrowing the disorder or shows definite symptoms of scoliosis of the usual type.

Partial or complete occlusion of the pancreatic duct, due to inflammation, is sometimes present.

In some cases improper feeding seems to be the sole etiological factor; and in the cases due to spinal lesions improper feeding or improper therapeutics may be important factors. The giving of excessive amounts of fats is a common error in bottle-fed babies. At weaning time, the giving of too much solid foods, or of improperly cooked cereals or vegetables, is common. Often an attack of diarrhea initiates the chronic condition.

**Pathology.** The distension of the small intestine and the colon, and the very large protuberant abdomen are the most marked structural changes. Hypertrophy and ulceration are absent; this distinguishes this disease from Hirschsprung's disease.

**Symptoms** are definite. The large abdomen attracts notice at once, though this is less marked than in congenital dilatation of the colon. Tympanites is marked, especially during the daytime; it may disappear at night, when rest removes the tension from the weakened spinal column and permits an approach to the normal circulation and innervation of the bowels.

The intestinal contents, slowly moving through the dilated bowel, with abundant opportunities for fermentation and putrefaction, lacking at least something of the normal digestive juices, offer excellent facilities for intestinal toxemia,—and this is conspicuously a factor in the constitutional symptoms. Anorexia, malnutrition, emaciation, are marked. Distress in the abdomen is due partly to the flatulence and partly, no doubt, to the irritating intestinal contents. Such children are pale and sallow, they do not sleep well, grind the teeth and suffer from night terrors; they are cross and hard to manage and eccentric in their affections and their customs. They are often precocious mentally.

Fever is rarely present, and the temperature does not often reach 102°F.; when fever does occur, it is probably due to the toxemia. Sweating is often a serious symptom. General edema; more rarely, local edemas, may occur. The urine is heavy with indican and often with acetone and diacetic acid.

Constipation or diarrhea or alternating periods of these, may be present. Whether the child is constipated or diarrheic, the stools are extremely large, and are often pale, grayish, greasy in appearance, and of foul odor. During diarrhea, the character may change somewhat, but such changes are temporary. Fats are not digested; they delay the passage of the food materials through the gastrointestinal tract; carbohydrates are thus permitted time for fermentation, and proteids for putrefaction.



Nervous symptoms may be very severe,—convulsions which may resemble grand mal or petit mal; stupor; urticaria or erythema; respiratory or cardiac irregularities; exaggerated reflexes, may suggest meningitis.

With all of these varying and apparently irrational symptoms, intermissions may occur and the child seem to be on the way to recovery. Relapses follow speedily, however. Attacks of very severe diarrhea may occur, and immunity is lowered, so that any infectious disease, especially infectious diarrhea, gains easy foothold and is often fatal.

These symptoms may persist for years, if proper treatment is not given.

**Treatment** must be devoted to two lines,—correction of the structural abnormalities, and the determination of an adequate and non-irritating diet.

For the spinal deviations, the usual technical methods are best employed with rather more than usual gentleness. In diarrheic states, the springing manipulations are useful; they may be given in such a manner as to correct the lordotic areas. Mobility of every articulation should be secured. The intervertebral disks are less elastic than normal in these spines, and the child should lie down for ten to twenty minutes several times each day; he should remain prone after each treatment; and if he takes a nap also that is still better. He should be taught to lie often in the left lateral and the right lateral position, alternately, and to lie supine and prone alternately. A sort of game can be devised, to make it interesting.

The parents must understand that these cases are very slow in recovery, and that an exacerbation of symptoms may occur, even with the best of care; that unless treatment can be given properly, and unless the co-operation of the mother and nurse can be cordially given, no good results are to be expected.

**Diet.** The fats must be removed from the food completely, and the carbohydrates cut down to a very low amount; it may be necessary to eliminate these also. Protein milk, skimmed milk, any of the fermented milks, made without cream, can be given. Goat's milk may be well handled, though the difficulty of removing the fat from goat's milk may give trouble; occasionally a child can handle goat's milk, cream and all, when cow's milk cannot be digested. Meat broths may be permitted, in order to increase the appetite, but they are less desirable. Abt recommends feeding a very fine vegetable puree; young carrots, lettuce, artichoke hearts, and spinach are thoroughly cooked, and are then ground in a nut-butter machine, so that an extremely fine, homogeneous mass is secured. This is usually well handled, and the digestion and nutrition of the child much improved. The water in which such vege-



tables have been boiled may be given, if the pulp cannot be taken; this vegetable broth must be well diluted if it has strong flavor. Vitamines are thus provided abundantly.

In planning diets for these children, their digestive powers and not their metabolic requirements must be considered. This very limited diet must be kept up for three weeks to four months, according to the symptoms. When improvement is noted, fat may be given; cod liver oil is often well handled when other oils cannot be taken. Olive oil, made into an emulsion, can sometimes be well managed. Only a few drops should be given the first few days; the amount can then be gradually increased if no untoward symptoms arise. Cow's milk must usually be withheld for months or years. Goat's milk or mare's milk can sometimes be taken when cow's milk cannot be given at all.

The carbohydrates are usually given after some tolerance to fat has been established. Occasionally when fat-tolerance cannot be established, carbohydrates can be given in small amounts; maltose preparations are best at first. Later cereal jellies, toast water, and other carbohydrates can be given, always very gradually, and with return to limited diet on the re-appearance of the symptoms.

Exercises for the strengthening of the abdominal muscles are to be given, at first in moderation. Movements of the legs are first taught, then the voluntary control of the abdominal muscles. Any of the ordinary exercises which bring into play the muscles of the thighs, legs, loins and thorax are useful. The visceral muscles share in good results of the increased activity of the voluntary muscles. The spinal condition is improved also by correctly planned exercises, adapted to the condition of the individual child, and this, in turn, facilitates the strengthening of the intestinal walls.

Enemas and suppositories are occasionally required for the relief of the constipation or the diarrhea. They should not be used until a habit is established, though even an enema habit is better than persistent chronic intestinal indigestion. The return to normal structural conditions, and the persistent use of a well-planned diet, should soon result in normal bowel action.

## CHAPTER XIX

### NONINFECTIOUS DIARRHEAL DISEASES

Diarrhea is one of the symptoms of many of the diseases of infancy and early childhood, and it is the chief symptom in several diseases. These diseases in which diarrhea is the chief symptom, and in which the diarrhea itself is responsible for the injury to the health of the child, present many points of similarity in etiology, diagnosis and treatment, while they vary in other factors. In order to avoid repetition, the common factors will be discussed first, and the differential points considered later.

#### General Etiology

Age is important; babies from four to thirty months old suffer far more frequently than do tiny babies or older children. At four months, babies are beginning to sit alone; they are becoming heavier, and the mother finds it increasingly difficult to handle them. In a few months more they are beginning to sit alone, and they fall often; by the end of the first year they are beginning to stand and to walk, and they have many falls and strains. The mother holds them as they are squirming about, in the bath, or in bed; or she carries the baby on one hip as she works or stands talking. Babies during this time are very restless and inquisitive, eating many things and doing many things which they ought not to do. Older people romp with them unwisely, causing strains; and they give babies wrong things to eat; hence the great tendency to diarrheal diseases during these months.

**Lesions.** Rigidity of the lower thoracic spinal column is nearly always present during a diarrheal attack. Lesions of the third lumbar vertebra are constant; lesions of vertebra from the eighth to the twelfth thoracic are also commonly present. Rigidity of the thorax is usually marked. These lesions affect the innervation of the intestinal glands and muscles, and affect also the circulation of the blood through the entire gastrointestinal tract; this has been thoroughly demonstrated by experiments upon animals, as well as by clinical studies.

**Sanitary Conditions.** Hot weather greatly increases the frequency and the severity of the attacks. Uncleanliness in the surroundings and food is of prime importance. Poverty, crowding, previous ill health, poor nutrition, poor air, all of these factors are important causes of the diarrheal diseases. Poverty is not essential to uncleanliness; careless mothers and ignorant nurses are often found in homes of wealth. The children of intelligent and fairly well-to-do families are affected rather rarely.

**Artificial food** is also a cause; this because such great care is necessary to prevent contamination, and also because the planning and preparing of such food requires care and understanding, as well as cleanliness. Breast-fed babies very rarely have these diseases, even though their surroundings may fail considerably of being sanitary or pleasant.

**Bacteria.** Pathogenic micro-organisms are responsible for diarrheas of a very severe type, when these are associated with the other etiological factors mentioned. These are usually called dysenteries, and they require separate discussion. Bacteria which do not appear to be pathogenic in any specific sense seem to be responsible for diarrhea when they are present in very great numbers. It seems that some poisonous change is produced in the milk by their presence, or that the bodies of the bacteria themselves are poisonous without being definitely pathogenic in the ordinary sense of the word. Still, the study of these conditions is not yet completed, and it may be that some pathogenic organism has, as yet, escaped recognition. There seems no question that children who are kept clean and who are well cared for may take milk containing abundant bacteria (the very milk which seems to have fatal results in neglected children) and yet suffer little or no ill effects. This is especially true when there is not any excessive heat, and when the surroundings of the children are clean. High bacterial count in the winter does not cause any prevalence of diarrhea, and individual cases are very rare during cold months. It seems that bacteria are never the sole cause of these diseases.

### Types of Diarrhea

Acute intestinal indigestion is a general term which includes diarrheas due to several very different etiological factors, together with those mentioned under General Etiology. These diarrheal diseases are usually classified as mechanical, fermentative, proteolytic, symptomatic and infectious. To this list should be added cholera infantum, which resembles the infectious type, though no infectious organisms have yet been found associated with it, and the occurrence of the disease does not follow the usual rules of transmission of infection. It must not be forgotten that these various types of diarrhea are associated with the factors already mentioned under General Etiology.

**Mechanical diarrhea** does not often occur during early infancy, but is very common from the time of weaning to the third year. Foreign bodies, improper foods, especially food which has large and tough residue, or milk which produces large, hard curds, may be responsible. Anything which irritates the intestinal lining may cause this type of diarrhea. Corn, cabbage, unripe fruit, rough breads, grape seeds, fig seeds, are such improper foods.

The diarrhea itself may be the only symptom, or there may be vomiting and abdominal distress. With evacuation of the irritating substances, recovery is speedy and complete. Very rarely is there any fever, or any prostration.

**Fermentative diarrhea** is most prevalent during the summer. It is associated with an excess of sugar in the diet. It must be remembered that breast milk contains high sugar content; if, then, sweet foods are given to a child, its sugar intake may be very greatly above its digestive ability.

The attack is not really sudden, though it may seem so. For several days before the sudden exacerbation the bowels have been rather loose, there has been some regurgitation of sour fluids from the stomach, and the stools have smelled sour, and have caused irritation of the skin of the buttocks. After these prodromal symptoms, the diarrhea rather suddenly increases in severity. The stools are very copious, and contain much liquid; this is usually absorbed by the diaper, so that the mother may fail to realize the great loss of water by the diarrhea. There may be considerable abdominal pain, partly due to excessive gas formation, and occasionally feverishness occurs. If the diarrhea continues and dehydration becomes marked, fever may reach 103°F. or more.

**Proteolytic diarrhea** is due to the presence of putrefactive bacteria in excess in the intestines. This condition is itself due to a proportional excess, though not necessarily an absolute excess, of protein foods.

It is characterized by the stools, which are yellowish or brownish, semisolid or liquid, and usually of very foul odor. Occasionally the odor is musty; rarely no unpleasant odor is found. Fever is not usually above 102°F. and may not be present.

**Symptomatic diarrheas** are due to other diseases, and usually are due to some toxic factor. Uremia, the acute infections, the absorption of poisonous substances, sapremia, are some of the causes of symptomatic diarrhea.

The infectious diarrheas are discussed in a later section.

### **General Pathology of the Non-infectious Diarrheas**

Tissue changes are rarely marked in the noninfectious diarrheas. A mild catarrhal appearance may be found throughout the entire extent of the stomach and intestines, in fatal cases. Autopsies of children dying of other diseases, during mild attacks of indigestion, present no distinct pathological changes of the intestinal tract. Infectious diarrheas, on the other hand, do present very distinct tissue lesions, and these are described later.

### **General Diagnosis**

**The symptoms** vary from very mild cases to those of extremely severe type, with acidosis. In milder cases there may be vomiting



and gastric symptoms, or the disease may show only intestinal symptoms. Colicky, sharp abdominal pain, abdominal distress, tympanites, nervous twitchings, rarely convulsions, may be noted before the diarrhea begins. The diarrhea may be slight, or there may be ten to fifteen stools each day.

**Stools.** At first, these are composed of fecal material, but they soon become liquid and greenish or yellowish from biliverdin. Fatty curds are common. The reaction is almost invariably acid, and the stools may be very frothy from the great amount of gas present. The odor of the stool varies; in fermentative diarrhea the odor is very sour; in proteolytic diarrhea the odor is foul, musty, or putrid; in mechanical diarrhea the odor is not usually very abnormal. In mild cases neither blood nor any great amount of mucus is found in or upon the stools.

A few blood cells can usually be found by careful microscopic examination. Desquamated epithelium is abundant, even in mild cases. The chemistry of the stools varies in diarrhea; there is about seven percent of solids as against the twenty percent of solids in normal stools. In diarrheal stools sodium, potassium and chlorine make up nearly half of the ash; in normal stools these salts make up about one-tenth of the ash. There is, then, in diarrhea a great waste of water and of the inorganic salts (Holt). These losses may soon become fatal, unless by some method they are replaced by the administration of suitable amounts of water and salts. The blood may show concentration, but leucocytosis is rarely present.

**Severe cases.** If these mild cases are neglected, or in cases of more severe onset, the symptoms are greatly exaggerated. Vomiting may be very severe, and it may persist for several days. Mucus, blood and bile may be vomited. Fever may reach 102°F. or even higher. Restlessness and discomfort are constantly manifest; the baby cries almost constantly, and occasionally draws up the legs with symptoms of acute abdominal pain. Thirst is usually constant; though he may refuse to take anything into the mouth at all. Stupor, convulsions, depressed fontanel, sunken eyes, an expression of prostration, weak pulse and irregular breathing all indicate that the child is really very ill. Leucocytosis to 15,000, chiefly polymorphonuclear, may be found on blood examination.

**The stools** become liquid and very foul; they are greenish, brownish, or gray, and contain varying amounts of mucus, blood and bile. Desquamated epithelium is abundant, and it may be found in shreds. There may be twenty or more stools each day; and the colicky pains, griping and tenesmus may be very severe.

If recovery should not take place soon, even more serious symptoms are soon present. With persistent high fever, sometimes to 106°F. or higher, with the persistent diarrhea and the suffering, prostration and dessication become very serious. The skin is very



dry and harsh. The eyes are dull and sunken. The urine is very scanty and highly colored; it usually contains some albumen, casts and kidney cells; blood may occasionally be found in the urine.

**Acidosis.** When dessication is marked, acidosis is very apt to occur. An odor of acetone may be noted in the breath of the child. Acetone, diacetic acid, sugar and albumen are present abundantly in the urine. Air-hunger is pronounced, the child gasps for breath, though the heart's action may be fairly normal. Restlessness and insomnia are acute; the child may go to sleep, only to awaken almost at once with a sharp cry. Convulsion, stupor or coma may occur; these may usher in the almost inevitable death. Leucocytosis usually reaches 25,000 or more.

So many of the acute infectious diseases begin with gastrointestinal symptoms that diagnosis is very difficult in the very early stages. Pneumonia and meningitis, as well as the exanthemata, afford opportunity for erroneous diagnosis when vomiting and diarrhea usher in a fever, especially when respiration is rapid or nervous symptoms are marked. If the diarrhea persists for a day or two, if the vomiting ceases, and if characteristic symptoms of other diseases fail to appear, the existence of acute intestinal indigestion may be verified.

The diagnosis of the kind of diarrhea may be difficult. The history of eating improper food, together with speedy recovery after the digestive tract has been emptied, gives the diagnosis of mechanical diarrhea. The sour stools, especially with excoriation of the buttocks, suggest fermentative diarrhea. The putrid odor of the stools, and the history of difficult feeding, suggest proteolytic diarrhea. In all cases a history of the previous symptoms and the character of the feeding helps in the diagnosis. Cholera infantum is recognized by the severe character of the vomiting and the character of the stools.

Acidosis is recognized by the air hunger and the odor of acetone in the breath, and the presence of acetone, diacetic acid and sugar in the urine.

Infectious diarrhea, or dysentery, should be suspected when mucus and blood appear early in the stools. The finding of the bacillus dysenteriae, or the ameba histolytica, makes the diagnosis positive. A negative report is of little value, unless repeated examinations are made.

### General Treatment

**Treatment** of the diarrheal diseases by osteopathic practitioners is usually very much more successful than is to be expected when the reports given in ordinary medical books are consulted. No doubt this is due to the fact that under ordinary medical care the structural relations of the body are neglected.

Physical examination of a child suffering from diarrhea always shows rigidity in the lower thoracic and upper lumbar spinal column, abnormal rigidity of the thoracic walls, heat of the skin over the abdomen, cold or chilly hands and feet, and considerably lowered temperature of the skin over the back and the shoulders and legs. Definite lesions of the eighth to the twelfth thoracic vertebra are very commonly found.

These facts and the consideration of the other etiological factors determine the treatment. Increasing the flexibility of the rigid spinal column and the thorax usually equalizes the temperature of the body and the circulation of the blood rather speedily. Respiration is affected, and the pulse beat approaches normal, during the treatment. If the intestinal tract has been fairly well cleansed from the irritating materials, this treatment alone may cause the diarrhea to stop. If irritating substances still remain, or if pathogenic bacteria are active, this treatment alone is not apt to terminate the diarrhea.

Sharp, springing manipulations given in the spinal area most affected by muscular contractions, or over the spinous processes of the eighth, ninth and tenth thoracic vertebra, followed by quick, and yet gentle raising of the lower ribs, usually causes cessation of the diarrhea for some hours, even in the infectious cases. This treatment may be repeated at the discretion of the physician. The mother or nurse should be taught to give gentle, relaxing massage of the spinal muscles, and these equalize the circulation and the temperature of the parts of the body, and give great relief. The mother must be warned against any attempt to imitate the corrective manipulations, unless she is a well-trained osteopath. Even then, it is better to leave all definite corrective work to the physician who is in charge of the case, unless some emergency arises.

**Diet.** Upon the onset of diarrhea, food must be withheld for several feedings. Boiled water must be given very freely. Barley water may be used in mild cases; Holt advises very weak tea, preferably sweetened with saccharine; milk must be omitted completely under all circumstances; and no sweets are to be permitted. If the child is breast-fed, which is extremely uncommon, nursing must be avoided until the vomiting ceases. (The breasts should be pumped in order to keep up the future food supply of the child). Twenty-four hours of rest, at least, should be given the stomach after any serious gastrointestinal disorder. Dehydration is the great danger in diarrheas, and this must be prevented by the administration of enough water to replace that lost in the stools and urine and sweat; it must not be forgotten that in fever evaporation from the skin and the lungs is very considerably increased.

In mechanical diarrheas, all food must be stopped, and water given freely until the irritating substances have been eliminated.

Return to normal feeding should be somewhat gradual, but the child should be on his normal diet within two days, at most. If cow's milk has been used, and the curds have not been digested, goat's milk or some other new food should be used for a time.

In fermentative diarrheas, carbohydrates must be kept to a minimum for several days after the attack has subsided, and permanent reduction of the sweets, especially, should be made. This form of diarrhea is due to the use of excessive amounts of sweets and starches, hence the necessity of correcting the abuse.

In proteolytic diarrheas, milk must be withheld for several days after the attack has subsided. Protein milk, or any of the fermented milk preparations, may be used. After the disease has been under control for several days, and the need for milk is apparent, milk may be given, at first greatly diluted, and then gradually brought to the formula proper for the child's age and size. Goat's milk may be substituted for cow's milk, if breast milk cannot be secured.

When milk is finally given, sugar must be withheld at first. The combination of sugar and cow's milk is often productive of relapse in disorders of digestion, and the relapse may be more serious than the original attack.

Dextri-maltose, or any of the malt preparations, may be given when the stools are fairly normal in appearance and consistency. Upon any indication of relapse, food must be withheld and water, barley water, or very weak tea be given as before. The subsequent return to normal feeding must be made with even greater caution than was employed at first.

In older children, food must be withheld until the vomiting ceases. Broths and very thin gruels may then be given. Junket from which the whey has been strained is often well received, and it seems to give nutrition without irritation. Cereal jellies are useful. Eggs, milk and sugar must be avoided until at least one day after the diarrhea has ceased. The diet must be carefully guarded for several weeks after any diarrhea in a child.

**Vomiting.** In any case of vomiting, the stomach requires to be emptied. The plentiful drinking of water facilitates the washing, and provides for the water intake, if it is not vomited. Warm water, or very weak warm tea is sometimes retained better than cool water. Ice may be placed in the mouth and allowed to melt; this often relieves the vomiting. If these are not retained, after the stomach seems to be well cleansed, no further attempt should be made to give anything for several hours, at least. Gavage may be used in urgent cases; weak soda solution or normal salt solution should be used. Distilled water alone should not be used for gavage.

**Enemas.** The colon should be washed at once. Water may be retained and absorbed after the colon has been cleansed. If the

bowel is too irritable to permit water to be retained, the Murphy drip or the two-way tube may be used for continuous irrigation; this may be maintained for an hour or several hours in severe cases. The bowel walls absorb much liquid during such irrigations, and dehydration is prevented; diarrhea usually ceases during this time. A soft rubber catheter should be used for injecting the water into the sigmoid.

When the abdominal distress and the tenesmus seem severe, or when the stools contain mucus and blood, a thin boiled starch solution, or thin rice water, may be used for enemas or may be given by mouth. These thin solutions seem to provide a covering for the inflamed intestinal walls, and, unless contraindicated, provide considerable nutrition.

**Baths.** When prostration is marked and collapse seems imminent, or when convulsions occur, the child may be placed in a neutral bath. Mustard may be added to the bath if the temperature is subnormal; it may provide desirable stimulation even during fever. Cool sponging often relieves nervousness and lowers the temperature.

**Drugs.** The use of laudanum, paregoric, brandy, and other drugs is mentioned only to be condemned. The amount absorbed cannot be accurately determined; dangerous poisoning may result from even very small doses, and this may be fatal to a weakly child. No real good, and much harm, is done by giving drugs to children.

**Acidosis.** When symptoms of acidosis occur, treatment must be speedy and effective. The flexibility of the entire spinal column must be increased, the ribs raised several times, filling the lungs with air as nearly completely as is possible, and securing better circulation through the liver, especially. The Murphy drip or intestinal irrigation should be given with 5% sodium bicarbonate. (It is not possible to sterilize this solution by boiling; if the solution is made with sterile water, in a sterile vessel, using soda from a freshly-opened package, it is sufficiently sterile for these purposes.)

Rarely these measures fail to relieve the acidosis, and dehydration may occur. Hypodermoclysis or intraperitoneal injections of normal salt solution, made barely alkaline with sodium bicarbonate, may be given in this emergency. Four to eight ounces of fluid may be given each day, and this may permit recovery even in apparently moribund children.

**Hygiene.** The baby should be moved to a cooler place, if the attack occurs in hot weather. The utmost cleanliness of the baby and of his surroundings must be urgently advised. Fresh air is of great value; a fan, which sends the air past a wet sheet, may provide opportunity for recovery. The bed should be firm; no feather beds or down pillows are permissible. Bathing provides both cleanliness and comfort; a sponge bath may be given several



times each day while the baby is feverish and while the weather is hot. The baby should not be moved or lifted more than is absolutely necessary; much rest is essential to recovery. A single thin garment is all the clothing necessary. The diapers must be removed at once; if the stools are very frequent, pads may be placed under the baby's hips, and these removed with less fatigue than is necessary in removing and replacing a diaper.

**Prognosis** is good if treatment can be given in the early stages. In later stages, or more serious attacks, the prognosis is guarded. Recovery often occurs in babies apparently dying, and treatment should be continued with energy and hopefulness until death is actually at hand.

**Prophylaxis.** In order to prevent further attacks in the same child, or in other children, hygienic conditions must be reformed. City children should be sent to the mountains, the seashore or the country during the hot months, if possible. Even an occasional excursion for a day on a boat or into the country, increases the child's resistance. A baby's life may be saved by such an excursion, with cool, fresh air even for one day.

Homes must be kept clean and comfortable. Attention to ventilation, the use of fans, especially when the air plays across wet sheets, may protect the children from disease during the summer.

Food is most important. Mothers should nurse their babies whenever this is, at any sacrifice, possible. As the result of poverty, mothers may be compelled to work, and thus they cannot have time for nursing; indeed, they may not have the milk when the work is arduous. It is the part of good citizenship to arrange that mothers can nurse their babies. It does not seem to be the fact of artificial feeding that is harmful, however, it is the improper preparation and uncleanly methods of keeping the food that makes bottle-fed babies subject to the diarrheal diseases. Not only must the milk be clean when it reaches the home, but it must be kept clean until the baby swallows it. The ignorant feeding of little babies or older children with improper food, food often unfit even for adult stomachs, is responsible for much sickness.

## CHOLERA INFANTUM

Cholera infantum differs clinically from the other types of diarrhea just mentioned. Its etiology, other than the common etiological factors of diarrhea, is not yet known. It is much less common than is generally supposed; there is an unfortunate custom of giving this name to any serious diarrheal disease occurring in childhood, in summer.

**Symptoms.** The onset is apparently very sudden. After a few attacks of indigestion which appear to be light, and from which the child seems to recover fairly well, there is sudden exacerbation.



Some prostration is usually the first symptom, with chilliness. This is followed by steady rise in temperature, usually to 102 to 103°F., and after an hour or a few hours vomiting and severe diarrhea begin; either may precede the other.

Vomiting is sometimes very severe. First the food last eaten, then gastric juice, serum and mucus, then bile and intestinal contents, with or without bloody streaks, are vomited with severe retching.

Diarrhea is also very severe; stools may be passed two or three times every hour. They are first fairly normal, then become green, if the diet has been chiefly carbohydrate; brown if it consists of considerable maltose; pale, if an excess of fat has been eaten; the food eaten during the previous day may be passed almost unchanged. Later the stools become thin, colorless, odorless, alkaline, serous, and they contain blood and mucus. The stools contain great numbers of bacteria of different kinds, and many desquamated epithelial cells from the intestinal walls. Leucocytes are usually abundant, but no pus is found. Blood streaks may be present, or blood may be mixed with the stools and partly digested.

The great loss of water causes serious symptoms; the fontanels are depressed; the eyes sunken; prostration is marked; thirst is very severe; and the loss of weight is very rapid. The face looks anxious and drawn and sharp. Nervous twitching, restlessness and insomnia are common; later convulsions and coma often lead to death. The urine is scanty, rather dark, and contains albumen, casts and epithelium as in mild nephritis.

The temperature rises steadily, according to the severity of the attack. Light cases usually do not give a temperature above 103.5°F., but in serious cases, and in fatal cases just before death, there may be a temperature of 105°F. or even to 108°F. The skin is clammy and there is cold sweating with chilly feet and hands, in these high temperatures.

The pulse is rapid, later becoming very weak and irregular. Respiration is rapid, irregular, occasionally of the Cheyne-Stokes type, often stertorous. The tongue is coated at first, but later is red, dry and swollen; it may be protruded.

The vomiting, diarrhea and fever may cease, and the patient pass into a coma or algid state; the temperature may be subnormal; the head retracted and the abdomen sunken. This usually precedes death, but recovery is sometimes possible.

Sclerema is a rare, and almost always fatal, complication. Thyroid extract should be given when this occurs.

Acidosis may be severe. Respirations are difficult, and air hunger is marked. There is an odor of acetone (apple blossoms) in the breath, the urine contains acetone and diacetic acid, and the usual evidences of nephritis of mild type.

Leucocytosis may reach 30,000, but is usually less marked. Hyperpnea is always a bad sign, and children with a complicating acidosis usually die.

**Diagnosis.** The sudden onset with fever preceding the digestive symptoms may suggest pneumonia or the acute infections of childhood. The symptomatic digestive symptoms disappear speedily, while in cholera infantum they increase in severity. The typical characteristics of the acute infections should appear shortly after the digestive symptoms, and if they do not do so, those diseases are eliminated. Several days may elapse before the diagnosis can be made. When the nervous symptoms are marked, meningitis is suspected, and there may be difficulty in excluding this. When diarrhea is marked, meningitis is rather doubtful.

**The treatment** is that given in severe cases of other non-infectious diarrheas.

**Prognosis** is guarded... With early and rational treatment, nearly all cases recover. If the temperature is high; if hyperpnea and other indications of acidosis are marked; if dehydration is marked and if fluid cannot be adequately administered; if the nervous symptoms are profound, there is small hope of recovery. Still, even when the child seems actually dying, recovery may occur with astonishing rapidity, when proper treatment is given.

## CHAPTER XX

### INFECTIOUS DIARRHEA, OR DYSENTERY

This disease is characterized by the presence of some definite infectious pathogenic organism, usually the bacillus dysenteriae, and by the destructive effects of the disease upon the intestinal walls. In the noninfectious diarrheas, no definite tissue lesions are produced; in infectious diarrhea, there are definite, though varying, injuries to the intestinal and gastric walls.

**Etiology.** In addition to the general etiological factors already mentioned, pathogenic organisms are present and can be recovered from the stools. The bacillus dysenteriae and the ameba histolytica, are the most common agents. Streptococcus, the gas bacillus of Welch, bacillus pyocyaneus, have occasionally seemed to be the essential pathogenic agents, but they are far more frequently secondary infections, adding their own pathogenic qualities to those of their predecessors,—usually one of the varieties of bacillus dysenteriae.

Several varieties of this bacillus have been described,—the bacillus of Flexner, of Shiga, and of Hiss and Russell. The bacillus of Shiga seems to include two different strains, one, the “true,” causing alkaline stools, the other, the “acid,” producing acid stools. The bacillus dysenteriae seems to be present in the stools of normal children, hence its presence alone is not definitely pathogenic. The factors mentioned in the General Etiology of the diseases discussed in the preceding section seem essential to the pathogenicity of the bacillus dysenteriae.

The bacillus has not been found outside the body, and the manner of its transmission is not yet known.

**Pathology.** These diarrheas are characterized by various tissue changes, and these correspond, to some extent, with the severity of the attack.

**Acute catarrhal dysentery**, the mildest form, is associated with the usual findings in catarrhal inflammations of mucous membranes. The lower ileum and the colon are most commonly affected. Congestion of the upper areas of the folds appears in the mildest cases, and in the beginning of the attack; later, in more serious cases, the congestion involves the entire surface of the intestinal wall. The surface is covered with a layer of mucus which is very thick and tenacious, varying in thickness. This may include streaks of blood. Areas of hemorrhage, usually petechial, may be found, especially in the more serious cases. Desquamation of the superficial epithelium, with destruction around the orifices of the glands, may be found in most cases. The pathological processes, such as edema, round celled infiltration, are at first limited to the mucosa, but ultimately involve the deeper layers. Peyer's patches and the lymph nodes of the colon may or may not show swelling and infiltration. This catarrhal process causes no tissue change beyond the possibilities of repair, once the cause of the inflammation is eliminated.

**Ulcerative dysentery**; ulcerative ileocolitis, follows the catarrhal form, when this persists; or it may occur at a very early stage in severe attacks,

especially in children with lowered resistance. The inflammatory changes already described proceed to greater congestion, greater desquamation, greater erosion of the orifices of the glands. The membrane over the lymph nodules shows greater pathological changes, and becomes more or less completely eroded, forming rather large, shallow, superficial ulcerations. The lymph node usually shows at the center of the erosion.

**Follicular ileo-colitis** follows the type just mentioned. The lymph nodules are involved in the destructive process, and the ulcers are comparatively deep and show over-hanging edges; this appearance is due to the anatomical structure of the lymph nodes. Ten days to three weeks after the beginning of severe types of diarrhea, these deep ulcers may be found.

The ulceration is not limited to the lymph node, but spreads rather widely. By the coalescence of adjacent ulcers, great areas of the intestinal surface may be involved. The condition is probably always fatal, if any great number of such ulcers are present. Perforation occurs rarely.

During recovery, the ulcers heal by granulation and cicatrization. Small cysts may follow the cicatrization which occludes an intestinal gland; these may cause later irritability of colon, with vague symptoms. Ultimately they probably burst, leaving no ill effects, or their contents may be absorbed and the cysts disappear.

**Membranous dysentery** is an extremely severe form from the beginning. The catarrhal changes are associated with a fibrinous exudate which infiltrates the superficial layers of the intestine, even to the submucosa. The membrane itself is yellowish or grayish or greenish, according to the number of erythrocytes and the extent of their disintegration. It is usually granular or fissured, which gives an irregular appearance to its surface. Hemorrhagic areas vary in number and in extent. Small round cells, erythrocytes and bacteria are abundantly present in the membrane and in the infiltrated layers of the intestinal wall. This infiltration, congestion and edema causes the intestinal walls to attain great thickness. This condition is nearly always quickly fatal.

**Related tissues;** in dysentery other organs of the body show pathological changes, and these are associated with symptoms which may mask the diagnosis. Peritonitis occurs much less frequently than might be expected. Bronchopneumonia is very common, and may be the cause of death in cases otherwise not fatal. Tuberculosis is often associated with dysentery, and an old tubercular process may become rapidly fatal after dysentery. The kidneys are probably always affected to some extent; acute nephritis may be a fatal complication. Cloudy swelling, with varying other pathological changes, are found in the liver, spleen, heart and kidneys. Rarely the nervous system is involved.

## Diagnosis

**Symptoms** depend upon the nature of the pathological changes and the resistance of the child. In mild catarrhal cases, the symptoms point to the colon as the seat of the inflammation. Constitutional symptoms are not profound. The child does not seem very sick, has good appetite and clean tongue, and fever perhaps to 101°F., the chief symptom of his disease is the passing of six to ten mucous and bloody stools each day, with some pain and tenesmus. Recovery is usually rather prolonged; after ten days or longer, the stools either become fecal or assume the type of ordinary diarrheal stools, thence becoming normal very slowly.



Neglected cases, or cases of relapse, are often fatal, with the development of more serious symptoms and corresponding destructive changes in the intestine.

Catarrhal dysentery of moderate severity has usually sudden onset, with symptoms of acute indigestion for twelve hours or longer; the stools become bloody with abundant mucus after the food residue is eliminated; pain and tenesmus are marked. The temperature may reach 104°F. during the first day or two, but then subsides to 102°F. or even to normal. Prostration and dessication are marked; the tongue is coated and the child appears very seriously ill. The abdominal pain is very severe. Prolapsus ani is frequent, as the result of the severe straining. Recovery, if it occurs, is very slow; perhaps several months may pass before the child can be given his normal diet and show his usual vigor.

More severe attacks are more violently sudden in onset, and the symptoms are more severe. Vomiting is not marked, but the dysentery is severe, with bloody, mucous stools almost from the first. Prostration is profound; dessication marked; the tongue is coated and brown; sordes are present; nervous symptoms, such as restlessness, insomnia, convulsions and coma are noted, and the temperature remains high, 104°F. or more. Acidosis is frequently present; air hunger; the odor of acetone in the breath; acetone, diacetic acid and related bodies in the urine, all indicate the serious condition of the child. Death occurs from exhaustion and from toxemia during the severe symptoms, or later from pneumonia or other complication. If recovery occurs, the symptoms remain unchanged for days, occasionally for several weeks, and then diminish in severity very gradually.

**Follicular ulceration** usually follows previous attacks of diarrhea, and these may have been of the noninfectious type. It rarely occurs under six months, and is more frequently found in children of depleted strength. The onset of this attack may be very sudden, or it may directly follow one of the milder forms of diarrhea, and thus the onset appear gradual. The temperature is not very high at any time; even in fatal cases it rarely exceeds 101°F. The stools are not very frequent, usually about eight each day; they are composed of abundant masses of mucus, and may be dark green or brownish. The odor of the stools is usually very foul, especially after several days have elapsed. Desquamated epithelium and abundant small round cells are found in the stools, this latter is evidence of ulceration. Dessication, emaciation, bedsores, thrush or ulcerative stomatitis, prolapsus ani, these symptoms are usually present. Abdominal pain is less than in other forms, and even abdominal tenderness may not be great.

Recovery is hardly to be expected, and scarcely to be desired. Long and very tedious convalescence, with exacerbations at inter-



vals, great weakness for several months, tendency to tuberculosis, and diminished vitality in every respect, are to be expected. Any of the acute infections of childhood are apt to be fatal, for these children, or fatal malnutrition may occur at any time within the next few years, with no recognizable cause.

**Membranous dysentery**, the most severe of the bacillary dysenteries, causes the most obscure symptoms. At first, the symptoms are those of the catarrhal form,—abrupt onset with vomiting the first day, temperature to 102-105°F., abdominal pain and tenderness, diarrhea with catarrhal stools at first, with speedy dessication and the general appearance of severe illness. Later shreds of the false membrane may be found in the stools, especially by careful examination while the stool is being washed. Still later only a thin, dirty-looking fluid may be passed, without mucus, shreds or blood; at this time microscopical examination shows round cells, erythrocytes and small remnants of partly disintegrated membrane.

Cerebral symptoms may occur at any time, even before the vomiting. Convulsions, stupor, delirium, and high temperature may mask the diagnosis. Usually the diarrhea with characteristic stools appears within a day or a few days, but often the diagnosis is not made until autopsy shows the characteristic intestinal pathology.

In very young infants the symptoms are even more obscure; the stools vary in appearance, and may seem quite normal for several hours or a day; a diagnosis of pneumonia, typhoid, tuberculosis, or meningitis is often made and, unless autopsies are made, are not found to be erroneous.

Death is inevitable in young babies. Older children may live, but they are apt to suffer from chronic indigestion for months, perhaps years, afterward.

### Treatment

Immediate correction of such lesions as may be found on examination must be secured. Preliminary relaxation of the muscles is not desirable, if correction can be secured without it. When any movement has been secured in the lesioned area, treatment should be stopped and the condition watched for a few hours; these patients should be examined several times each day, if possible, and such treatment as is indicated should be given at once.

The mother may be taught to give some gentle massage to the loins and buttocks and around the anus; this diminishes the tenesmus and pain, and lessens the tendency to anal prolapse.

**Enemas.** The bowels should be washed with enemas, first, until irritating substances have been removed from the colon. Later continuous irrigation of the colon by a two-way tube, or by a Murphy drip, or by repeated very gentle enemas of normal salt solution, with a trace of bicarbonate of soda, carry away the excess of mucus

with its burden of bacteria, maintain normal water-content of the blood, and give much relief. A solution of boiled starch, or rice water, used as an enema, may give a thin, protective covering to the inflamed intestinal wall.

**Diet** is of great importance in these diseases. For the first day or few days, only water may be given, or barley water, rice water, or very weak tea may be permitted. After the vomiting ceases, much water must be given also; protein milk, or fermented milk preparations, and barley water or rice water may then be given in moderation. No malted foods, sweet milk, or sugar in any form should be permitted until recovery is fairly well on the way. Older children may be given junket from which the whey has been strained. When the more severe symptoms have disappeared, buttermilk, junket, eggs, and broths may be given with discretion. Carrots or spinach should be cooked in the broths, but none of the vegetable itself should be given.

**Sanitation.** Change of climate is desirable, especially in those children who are slow in convalescence. Even during the severe symptoms, a baby or child may recover much more quickly for a change to cooler climate, even at the risk of fatigue. Abundance of fresh air is as necessary in these cases as in the noninfectious types of diarrhea.

The discharges are to be very carefully disinfected. While the manner in which the bacteria are transmitted is not yet known, they are known to be abundant in the stools, and it is only sensible to destroy them. The bacillus dysenteriae has not yet been found outside of the body, except in cultures from stools.

**Prognosis.** In all infectious diarrheas the prospect of recovery is clouded. Long and tedious convalescence, with relapses upon every indiscretion in diet or care, are to be expected. With constant osteopathic attention and such treatment as is needed, the prognosis is distinctly brighter than when drugs are administered.

### Amebic Dysentery

This disease is becoming more common in this country, since the ease and frequency of travel to and from tropical countries is increasing.

**Etiology.** The infectious organism is an ameba, larger and differing somewhat in appearance from its more innocent relative, the ameba coli. The causes of other diarrheal diseases are predisposing factors in permitting invasion by the ameba histolytica, and in delaying or preventing recovery.

This ameba is productive of disease of the intestines more frequently than of other organs, but it produces extremely serious effects when it gains entrance into other tissues. Amebic conjunctivitis is extremely serious, and, unless quickly and thoroughly

treated, results in corneal ulcers and total blindness. Amebic abscess of the liver rarely occurs in children; it may be evacuated and recovery result promptly.

The ameba gains entrance into the body with food or other objects which the baby puts into his mouth. Uneleanly surroundings, and unsanitary and filthy habits are necessary to allow contamination of the baby's food, or his fingers or toys, with infected material,—which is usually fecal material or liquids contaminated with fecal material.

In some parts of the country, the use of human excrement for fertilizing fields of vegetables facilitates the distribution of this organism. Unecooked vegetables,—lettuce, celery, etc., sold from such fields, may carry the infection. Great care must be used when children are given vegetables and vegetable juices, that no soil is permitted to remain upon the vegetables. This danger is avoided if the vegetables are cooked. Sunlight destroys the ameba if it is not protected by a layer of the soil, or otherwise.

**Diagnosis** depends upon finding the ameba in the stools; they are most abundant in the mucus. The stools must be kept warm, but must not be heated too much, from the time they are passed until examined under a microscope, preferably upon a warm stage. They are not usually recognizable at all after they cease moving, though occasionally it is possible to find and recognize them by the character of the materials which they have ingested, erythrocytes, for example. The best way to get the material to the laboratory is to place the mucus-containing stool, or, preferably, a stool composed chiefly of mucus, in a glass jar which has been rinsed with warm water; then the jar must be tightly closed. This jar is then made into a bundle with a bag or jar of warm water, at about 110°F., and wrapped in many layers of newspapers. Such a bundle can be kept at a fairly steady warmth for several hours, in warm weather, and the stools reach the laboratory in good shape for the most accurate examinations. Even with this care, however, the stools should reach the laboratory as quickly as possible.

**The symptoms** are those of infectious dysentery; unless the stools are examined, the two diseases cannot be differentiated.

**Treatment** is that of infectious diarrhea. The stools must be very carefully disinfected, and great care employed to avoid infection of the eyes of the same child, or the infection of other children. Every particle of alvine discharges must be considered a carrier of a serious infectious agent, as indeed it is.

**Prognosis** is very grave. If treatment is given quickly and persistently, recovery may occur. Convalescence is not so prolonged as in the bacillary type of dysentery, and relapses, after the elimination of the infectious agent, are less common.

## CHAPTER XXI

### DISEASES OF THE INTESTINES ASSOCIATED WITH MARKED STRUCTURAL CHANGES

#### INTESTINAL OBSTRUCTION

A number of varying conditions may cause intestinal obstruction; and this may be either acute and almost or quite complete, or partial and chronic. Chronic obstruction may at any time become acute. The symptoms and treatment are about the same, from whatever cause the obstruction arises.

Intestinal obstruction is the term applied to any condition which seriously hinders the onward passage of the intestinal contents.

**Dynamic obstruction** is due to a failure of the muscular activity which propels the intestinal contents; this is rather rare in children, and is due to such factors as acute peritonitis; abdominal operations with injury to the intestines; contusions of the abdomen, or of testicles or ovaries; hysteria; injuries to the spinal cord; and pneumonia or other severe infections. Certain other causes in adults, such as renal calculus, infarction of the intestines, torsion of the pedicle of a tumor or cyst, are scarcely to be considered in childhood.

**Mechanical obstruction** is not rare in childhood, and some forms are more common in early life. This is due to intussusception, volvulus, worms, stricture or atresia, strangulation by abnormal fibrous bands, and other less common causes.

**Meckel's diverticulum** or a fibrous cord which is its remnant, or other fibrous bands resulting from malformations or from peritonitis early in life, may strangle the intestine and cause more or less complete obstruction. Internal hernia may be formed by the protrusion of the bowel, mesentery or omentum into loops of such tissues; the strangulation of such hernias causes rare, but very difficult cases of obstruction.

**Symptoms** of complete and acute obstruction are severe, including pain, vomiting, tympanites and collapse. Collapse or shock may be the first symptom noted; pain or vomiting may precede this. Pain is paroxysmal, sharp and colicky and very severe. Rarely pain is absent, probably as the result of pressure. Vomiting is not of characteristic type; the vomitus is first of gastric contents, after a time becoming bile-stained, later it may be fecal. Stools composed of feces may be passed after the attack for one or two evacuations; after the bowel is emptied of feces, mucus and blood are passed, sometimes rather frequently. Tenesmus may be present. Fever is



apt to occur soon, if it had not been present at the time of the attack. Later the temperature becomes subnormal.

Infants may not seem very ill for the first day; between the colicky pains the face may seem pleasantly comfortable, and the appetite may be good; food may be well taken and retained. Very soon the general effects prevent appetite and comfort; emaciation occurs speedily, if the baby lives at all.

### Intussusception

Intussusception consists in the invagination of one part of the intestine into another. The lower area, the intussuseptum, receives the upper area, the intussusepiens. The serous surface of the intussusepiens is then in contact with the serous surface of the inner fold of the intussuseptum, and the mucous surface of the outer fold of the intussusepiens is in contact with the mucous surface of the intussuseptum. The intussusepiens carries with it its part of the mesentery.

**Agonal intussusception** occurs at the time of death, and is due to irregular muscular action of the intestines. Such folds are easily reduced; show no evidences of inflammation or swelling; are usually multiple and invade the small intestine. Their presence is insignificant.

**Etiology.** The condition occurs much more frequently before the age of two, and about half of all cases occur between the fourth and the ninth months of life. Twice as many boys suffer from this cause as girls. Most of the cases occur, or, at any rate are recognized, in children previously in good health.

The mesentery is longer in babies than in larger children, and there is less difference in size between the ileum and the colon. These factors may account in part for the occurrence in children.

**Symptoms.** Intussusception alone causes no symptoms, but the pressure, the dragging of the mesentery, and the associated swelling, cause obstruction to the vessels, congestion, edema and finally intestinal obstruction, usually complete. Adhesions between the adjacent surfaces begin to occur at about the third to sixth day, after which reduction is not to be expected. Before this time, reduction may result from treatment, or it may occur spontaneously and recovery follow speedily.

If reduction does not occur, the invaginated portion may become gangrenous and slough off, being passed on with the fecal matter and discharged at about the tenth to the fourteenth day, according to the location of the injury and the condition of the bowels. Usually the mass is discharged as a whole, but occasionally it may be passed in shreds. About 6 per cent of intussusceptions in children, without operation and without reduction, undergo this sloughing;



the others are fatal with collapse or exhaustion or, more rarely, peritonitis.

**Diagnosis.** In addition to the symptoms of acute obstruction, intussusception has two distinguishing characteristics,—the tumor and the bloody-mucous stool.

**The tumor** is very definitely characteristic. In the usual case, it is present within a few hours or less after the initial symptoms, is sausage-shaped, often slightly curved, rarely rounded and smaller, and may be several inches long when the extent of the invagination is marked. It may seem to undergo spasmodic movements under the palpating fingers, but is usually rather rigid. Its location varies according to the area of the invagination.

**Area.** The most frequent location is at the ileocecal valve; the ileum invaginates the colon through the valve. Sometimes the cecum also is carried into the colon; sometimes the lower end of the ascending colon itself becomes a part of the intussusceptum. After the ileocecal region, the colon itself is most often affected; not rarely part of the sigmoid and upper rectum pass into the rectum and out through the anus. In about half the cases, the tumor can be palpated per rectum. Tenesmus and pain are very severe in this case. Occasionally the small intestine alone is involved. In that case the tumor may be anywhere in the abdomen; rather more often near the umbilicus. Sometimes no tumor can be found, but an area of local hyper-sensitiveness indicates the location of the invagination.

**Stool.** After the initial symptoms, one or more fecal stools may be passed, including material already in the bowel below the obstruction. The amount of this is greater, the higher the obstruction. After this, the stools are composed of mucous and blood, usually very well mixed together but varying in proportions; sometimes the blood seems uncontaminated.

### Volvulus

Volvulus is supposed to occur in fetal life, and to be one cause of intestinal malformations. In early infancy the mesentery is rather longer proportionately than during later life, and volvulus may, very rarely, occur. After infancy, the disorder is extremely rare. During adult life it again becomes somewhat more frequently found. The symptoms resemble those of intussusception, except that the blood and mucus of the stools are not well mixed, but are rather streaky, and, unless the obstruction is complete, some fecal material is found in the stools.

### Obstruction Due to Spasm of the Circular Fibers

Several cases are on record, in which a child has shown the symptoms of complete obstruction, yet on laparotomy no cause for the obstruction could be found. In such cases, the child usually

recovered from the anesthetic without any further symptoms of obstruction. This condition may recur; in one case a boy had two operations of this type, and, on a third similar attack, was not operated; he died with symptoms of obstruction. No doubt in such cases the obstruction is due to presence of such ring-like contractions as those observed in anesthetized animals.

**Etiology.** Vertebral lesions, irritating foreign bodies in the digestive tract, severe catharsis, increased peristalsis due to inflammatory conditions, all may, at times, be responsible for such obstructions. No doubt spontaneous recovery usually occurs.

Treatment includes correction of vertebral lesions and relaxation of the tissues from the fifth thoracic to the fourth lumbar spinal segments. Applications of moist heat over the abdomen are useful. Purgatives are absolutely contra-indicated. Abdominal massage is usually harmful, at least under experimental conditions in animals. Rest in bed is necessary. The use of water-pressure, as indicated below, may become necessary. If this does not result in the relaxation of the ring, surgical interference should be advised. The anesthesia may result in the relief of the condition; laparotomy may show some further cause of obstruction.

Anesthetized animals whose bowels are roughly handled, or whose vertebrae have been subjected to manipulations for the production of lesions, often show irregular and marked constrictions of the circular fibers of the intestines; this is often associated with very vigorous peristalsis, and under those circumstances slight degrees of intussusception have been produced. The contraction of the circular fibers produces a very persistent ring, which is easily invaginated slightly into a lower segment of the bowel, resembling the agonal intussusceptions in children. While these experiments have not yet been carried to their conclusion, it seems probable that a similar condition may be found in children. Healthy children, in their play, are subject to strains and jars which do produce vertebral lesions. Children of six months and upward are heavy, and are handled accordingly. They are beginning to sit alone, and to try to stand up and to walk. This is the time of most danger, so far as the production of lesions is concerned. Lesions of the eighth thoracic to the third lumbar vertebrae cause these abnormal and permanent ring-like contraction in mammals. Such lesions are present in children with intussusception. Correction of the lesion could not be expected to cure the intussusception, but correction should be made, in order to prevent any recurrence which might be due to its existence. Also, correction of such lesions secures better circulation and innervation of the injured tissues, after the intussusception has been reduced.

### Treatment

Treatment of acute intestinal obstruction includes various manipulations for removal of the cause of obstruction. Surgical relief must not be too long delayed, yet there are non-surgical measures which may be successful. While spontaneous reductions of hernia and of intussusception do, though rarely, occur; and while the sloughing of the intussusciens does occasionally occur, yet these are such rare recoveries that the condition should be considered fatal without proper treatment.

At the first examination, while yet the diagnosis is not completely determined, the baby may be held inverted, suspended from the feet, for part of a minute, while the abdomen is very gently palpated. Occasionally a foreign object, or inspissated feces, or an internal hernia, may be relieved by this procedure. Intussusception may, very rarely, also yield,—or what seems to be intussusception at the time (diagnosis is uncertain in many such cases).

External hernias are easily recognized; they may often be reduced by gentle manipulation, and a suitable bandage applied.

Internal hernias are rarely to be diagnosed exactly; the treatment is usually surgical, if there is no relief within a day after the acute symptoms, and within the shortest possible time in selected cases.

Intussusception, and occasionally internal hernia, may yield to internal pressure. The child should be placed with the buttocks elevated, at first. Normal salt solution, warm, sometimes slightly alkalized, is given by rectum. The solution should flow from a height of four to six feet, depending upon the age and the vigor of the child, and the danger of rupture of a gangrenous bowel. A folded towel or roll of cotton or gauze must be placed around the anus, and held firmly by an assistant. The solution should flow from a soft rubber catheter into the rectum, or sigmoid, according to the location of the tumor. As the bowel fills, pressure is gently and steadily exerted upon the terminal area of the intussusciens, and this should be pushed steadily backward until the fold is reduced. When this occurs, the pressure upon the anus is suddenly diminished, a bubbling sound can often be heard, the tumor disappears, and the condition of the child is suddenly very much relieved. The procedure is soon followed by discharge of fecal material, usually very foul, from the bowels; vomiting ceases, and the recovery is usually rather remarkably rapid.

During the flow of the water, steady pressure over the spinal area of greatest muscular tensions facilitates relaxation of the muscles of the abdomen and the intestinal wall, lowers blood pressure, and diminishes any discomfort to the child. If reduction does not occur within a few minutes after the pressure-flow has been begun, the child should be raised by the feet until his body is in-

verted, the water being allowed to flow constantly. If there is still no reduction, after the pressure has been maintained for 15 to 20 minutes, the solution should be allowed to flow from the bowels and the child prepared for the surgical relief of the condition.

Surgical treatment includes laparotomy, and the reduction of intussusception or hernia; removal or section of bands, tumors, or Meckel's diverticulum; correction of the position of the intestines in volvulus, and the correction of whatever other conditions are found responsible for the condition.

Surgical manipulation of the bowels is apt to result in intussusception or in dynamic obstruction or in acute dilatation of the stomach, especially in poorly nourished or neurotic children. For this reason manipulations of the intestines should be as slight as is consistent with rapid correction of such pathological conditions as are present, and, after the child has recovered from the immediate effects of the operation, the diet should be carefully watched, no violent exercises permitted, and, most important of all, no purgative drugs permitted.

## HERNIA

Hernia occurs most often during the first year of life, or in adult life. Rarely it may be found during later childhood, usually the result of infantile displacements growing worse.

**Umbilical hernia** may be either congenital or acquired. The congenital condition is, fortunately, rare; it is due to imperfect closure of the abdominal wall. In mild cases only the omentum is found in the sac; in others, loops of intestine, sometimes spleen, stomach and liver may be found in the sac. These deformities are usually incompatible with life; the child dies very soon in the serious conditions, or, if there is only slight deformity, may live as do normal babies.

**The treatment** depends upon the amount of deformity; reduction and bandages, in the milder cases; surgery in the more severe, and none at all in the graver cases.

Acquired umbilical hernia is a common condition. Two factors are present; an unusually weak abdominal wall, or a large ring, and unusual intra-abdominal pressure. The first is either a slight malformation or the result of weakness of the child, emaciation, or abdominal weakness due to constant gas pressure, or weakness due to some abnormal spinal condition. The second is due to excessive gas accumulations, straining at stool, coughing, or excessive crying. The hernia occurs most often at the upper side of the umbilicus, is usually a small, insensitive elastic tumor covered with skin. Its size varies from a mere elevation of the skin to the size of a small orange. Its size increases when the child coughs or strains or cries, and it can usually be reduced when the child is quiet. No other condition is likely to be confused with it, on careful examination.



**The treatment** consists in reduction and bandaging. The best bandage is made by the application of adhesive across the abdomen, extending outward over the lower ribs, brought across in such a manner as to infold the abdominal wall over the umbilicus, and firmly attached to the other side over the ribs.

Another method consists of wrapping some hard object, as a twenty-five cent piece, in gauze, placing this over the hernia, and then applying a tight band around the abdomen. This is much less efficacious, and may result in further weakness on account of the tight bandage around the abdomen and the pressure upon the lumbar spinal column. The pressure of anything which forces the ring is apt to enlarge the ring, and increase the evil. After the child has passed the first year, hernia is apt to resist ordinary methods of treatment, though these should be tried for a time. If the hernia persists, a simple surgical operation should be performed and the abdominal wall made whole in this way. The prognosis is excellent for complete recovery.

**Ventral hernia** is extremely rare. It consists of a protrusion of any of the abdominal contents through a defect in the abdominal wall elsewhere than at the umbilicus. The treatment is usually surgical, though very small hernias may sometimes be reduced and bandaged, and the wall become stronger with the growth of the baby.

**Diaphragmatic hernia** is congenital, except in the few cases due to trauma. Probably traumatic cases are possible only because of some diaphragmatic weakness. The intestines, stomach, spleen or liver protrude into the thoracic cavity. Very mild cases may live without symptoms; more often the deformity causes severe symptoms and early death. Treatment consists in guarding against increased intra-abdominal pressure, and immediate surgical treatment if dyspnea or symptoms of incarceration occur. The prognosis is always grave.

**Inguinal hernia** is rather more frequent than umbilical hernia after the first month of life. Direct inguinal hernia is very rare. Oblique inguinal hernia is common. Either may be either congenital or acquired; the acquired condition, however, depends upon structural relations which are probably congenital, such as patulous funicular process, short or straight canal, or wide inner ring. These structural conditions seem to be hereditary to some extent.

**The etiology**, aside from these structural states, includes the usual causes of increased intra-abdominal pressure,—straining at stool or urination, coughing, and excessive crying. Anything which impairs the general health, or diminishes the fatty tissue, or weakens the muscles, is a factor in etiology. Unduly tight abdominal bandages should be mentioned in this connection. Hydrocele may



present difficulties in diagnosis, but this does not change with coughing or straining, is more translucent by transmitted light, is not reducible by ordinary methods, is dull on percussion. Both conditions may occur together, which present a puzzling condition sometimes. Strangulation of inguinal hernia may be mistaken for colic, but an examination should show the hernia immediately.

**Treatment** is usually the wearing of a truss of hard rubber, or else a bandage made of a large skein of wool, looped around the waist of the child and over the hernial sac, with a knot over the hernia, large enough to keep it reduced. Much care is necessary to keep the skin in healthy condition under the truss or under the woolen bandage. If reduction cannot be secured, surgical treatment is necessary. The treatment by injection of paraffine in the abdominal wall has not given good results.

The prognosis is excellent for complete and permanent recovery.

**Strangulation** of any hernia may occur. The symptoms are those of acute intestinal obstruction. If the hernia cannot be quickly reduced, immediate surgical intervention is necessary to save the life of the baby.

## DILATATION OF THE COLON

**Hypertrophic dilatation** (Hirschsprung's Disease; Idiopathic Dilatation of the Colon) is a very marked dilatation of the colon and the sigmoid, with proportionately great hypertrophy of the muscularis mucosae. The dilatation is so great that in a child of two years the colon may contain three gallons of material. There may be inflammation and ulcers of the wall of the dilated areas.

**Etiology** is unknown, it is unquestionably a congenital condition. It may be an exaggeration of the normal tendency of the colon and sigmoid to become larger than the rest of the intestinal tract, at a certain time during embryonic life. The history of the condition and the autopsy findings preclude the possibility of this type of dilatation being secondary.

**Symptoms** are definite. There is marked constipation, usually beginning in early infancy. The bowels may move only once in two weeks; then several days of diarrhea may occur, with foul, thin, watery stools. Or the colon may never become completely evacuated, and the stools are foul and of varying consistency. Pus and blood may be found during the diarrheal attacks. Colic and vomiting may occur. The abdomen is very large. A child two years of age may have an abdominal circumference of 30 inches or more. When the colon has been completely emptied, the abdomen may be of normal size.

The condition should be suspected in children having very large abdomen and a history of obstinate constipation from infancy. The

diagnosis is confirmed by the roentgenological examination of the abdomen after an enema of bismuth or barium.

**Treatment** includes brisk stimulation of the lower thoracic and the lumbar region. Frequent enemas should be employed in order to keep the colon as nearly empty as can be. A well-fitting bandage around the abdomen may give relief. Massage may be helpful; only a very gentle and skillful masseur should be allowed to handle the child. Exercises which strengthen the muscles of the abdomen and the legs should be used, with care.

If the nutrition of the child suffers, and relief is not secured by the methods just outlined, surgical treatment should be advised. Dunn advises a double operation: First an anastomosis is made between the normal bowel above the dilatation and the normal portion below the dilatation, and a part of the dilated portion is stitched to the abdominal wall, so that in case of symptoms of acute obstruction an artificial anus can be made very quickly and easily. When the general strength of the child recovers from this operation, and the anastomotic wound becomes well healed, a second operation is performed, and the dilated portion of the bowel removed altogether.

When there is normal rectum enough to afford good union with the normal bowel above the dilated portion, and when the vitality of the child is fairly good, most cases recover well and live normal lives thereafter. When the dilatation involves the rectum to such an extent that anastomotic union is difficult, or when the child's nutrition is impaired, the prognosis is doubtful.

**Secondary dilatation** occurs as the result of obstruction. Rachitis is especially apt to be associated with dilated colon as the result of weakness of the wall of the colon. Other debilitating diseases may cause a similar condition. Obstinate constipation, with large, hard, dry stools may cause dilatation of sigmoid and colon, through the respiratory pressure and the presence of feces in large masses. Straining at stool may cause kinking of a rather long sigmoid, thus causing a partial obstruction. Obstruction due to the pressure of a cyst or tumor may occur in childhood and cause dilatation, but is more common in later life. The symptoms are the same as the milder cases of congenital dilatation, and the treatment is the same. The prognosis is brighter than in the congenital condition.

### FISSURE OF THE ANUS

As a result of constipation, straining at stool, or the use of hard rubber tubes, or irritating solutions in enemas, fissures may be caused around the anus. Healing is prevented by the factors which cause the original lesion.

**The symptoms** are often confused with colic. The child cries at stool, and often refuses to permit defecation on account of the pain. Examination of the anus shows the linear ulcer.

**Treatment** consists of cleanliness, protection of the ulcer, and the maintenance of liquid stools, preferably by enemas, given with a soft rubber catheter instead of the usual tube. Vaseline, cream, and other soothing, non-medicated applications give temporary relief. Massage around the anus facilitates better circulation of the blood and promotes healing. Very gentle stretching of the sphincter with an abundant supply of some emollient substance is sometimes required; this depends upon the existence of a contracted sphincter.

### PROLAPSE OF THE RECTUM

The mucous membrane of the lower portion of the rectum, or a considerable proportion of it, may protrude from the anus. It is not rarely found in children two or three years old, especially in those who are weakly. Straining at stool is the most common exciting cause, and it often occurs during attacks of diarrhea, especially when associated with tenesmus. There is a tumor, varying in size from a thin ring of pinkish membrane to a large purple mass, which comes down with each defecation. It usually returns after stool, but may require manual reduction. Diagnosis is easy upon recognition of the tumor, without symptoms of obstruction.

**Treatment** includes relief of constipation and of diarrhea. The child must be taught not to strain at stool, and the stool should be kept soft so that straining is not encouraged. The anal tissues should be supported during defecation in infants by holding the buttocks with the hands; in older children by providing a support, such as a roll of cotton folded around, or a specially devised toilet seat. Bathing with cool water gives relief from pain; injections of cool water may be also soothing. Ice water stimulates the tissues. Massage around the anus facilitates better circulation.

Stimulating treatment to the lumbar region should be given twice each week until the condition is relieved. Very often a lesion of the fourth lumbar vertebra is present. It must be remembered that at this age, two or three years, the child is very often hurt by falls, strains, or improper handling.

### HEMORRHOIDS

These are very rare in childhood; they are due chiefly to constipation when they do occur. Reduction, cold application, relief of the constipation, are the usual treatment. If long neglected, surgery may be required, but this is very rarely the case.

### NEOPLASMS

Tumors are very rare in childhood. Rectal polyps are the most common of these. They are myxomatous or adenomatous. The pedicle is usually rather long and thin. They are recognized when evidences of anal discomfort lead to rectal examination. Removal is usually very easy. They are not apt to recur.

### MALPOSITIONS AND MALFORMATIONS

The ascending colon may be found upon the left side and the descending upon the right. No harm results from these malpositions, except that diagnosis may be hindered in certain diseases.

The colon may be longer than normal, and present an extra loop extending from the splenic flexure to the region of the ileocecal valve, thence back almost to the splenic flexure again, thence downward as in the normal descending colon. Such a condition as this, and other forms of redundant colon, seem to be responsible for certain forms of toxemia. The condition may not be recognized until autopsy, and the person so affected may not be aware of any ill effects from the abnormality. In children, the occurrence of persistent toxemia should lead to an X-ray examination of the colon, not only on account of redundancy or dilatation, but also in order that the actual structural condition of the bowel can be recognized.

### CONGENITAL ATRESIA OR STENOSIS OF THE INTESTINE

This is a very rare condition; it is due to faulty development; usually other malformations are found elsewhere in the body. There may be a cord connecting the patulous portions above and below the stenotic part, or both upper and lower patulous portions may end in a blind pouch. The intestine above the deformity is dilated; the portion below is collapsed. Sometimes the stenosis is due to a tumor or pressure by Meckel's diverticulum.

**Symptoms** begin soon after birth,—colic pains, vomiting, lack of fecal discharges, distension of the abdomen. If the stenosis is high, as in the duodenum or upper jejunum, abdominal distension is not marked, and the vomiting begins very soon after birth. If the stenosis is lower, vomiting may not begin at once; abdominal distension is greater, and there may be fecal vomiting. Collapse, convulsions or asthenia result in death, usually within a week.

When there is any adequate passage, the symptoms may be much less severe, life may be prolonged, and ultimately a fairly normal digestion be established. Slight degrees of stenosis have been found at autopsy, in persons for whom no suspicion of the malformation had been noted.

### CONGENITAL ATRESIA OF RECTUM OR ANUS

This deformity is much more frequently found than is atresia of the colon or small intestine. There may be a membrane over the anus, with normal intestine above this; the more common form. It is easily remedied surgically. In a second form the anus and rectum show atresia; this is less easily remedied, but can be repaired. There may be an abnormal outlet into bladder, vagina or urethra. These cases are managed with difficulty. Only surgical repair is possible, and the type of operation varies with each anatomical peculiarity.



## CHAPTER XXII

### THE STOOLS OF INFANTS

**Number.** The normal number of stools in a breast-fed infant varies from three to four or five daily. An increase in the frequency suggests irritation of the intestinal mucosa; which may be due to excess nourishment. The size of the stool varies with the frequency and with the amount of food taken.

The number of stools is usually less in the bottle-fed baby. The size varies according to the number, and also according to the amount of food taken, and according to the character of the food. Diminished frequency and size of stools may be due to very thorough digestion and absorption of food.

**Appearance.** The consistency of the stool of the breast-fed infant is soft and mushy, often rather salve-like in character. It is usually described as golden yellow, yolk-yellow, or bright yellow in color, though dull yellow, greenish or pale yellow stools are often passed by infants in the best of health. In bottle-fed babies, the stools are firmer in consistency, as a rule, and are lighter in color. The quality of the food modifies these qualities to some extent.

**The odor** of the normal stool is not unpleasant, weakly acid and aromatic. Artificial foods too rich in carbohydrates give the stool a sour smell, from acetic or lactic acids present. Food too rich in protein gives the stool a musty or putrefactive odor.

**Abnormal stools.** The examination of the stools is very important in the diagnosis of infant's diseases, even when the gastrointestinal tract is not the primary seat of the disease. Both microscopical and chemical examinations are often necessary to make clear the diagnosis. The number of daily stools, the time of defecation, the ease or painfulness or tenesmus associated with defecation; straining, with or without the passage of gas or fecal material, all must be taken into consideration. The condition of the skin around the anus and over the buttocks is often important.

**The reaction**, normally faintly acid, may be very strongly acid in fermentative processes, or with excess of carbohydrate food; it may be alkaline with an excess of proteid food, or when alkaline drugs have been used. The alkaline reaction is not often an important factor in diagnosis.

**The odor** is sour when excess of carbohydrate food has been taken, rancid when fat digestion is imperfect or when an excess of fat has been used in the food; cheesy, musty or fecal in odor when excess of proteid is taken, or when putrefactive processes are occurring in the bowels.

The **color** varies widely. The normal yellowish or golden stools often turn to green or greenish on exposure to the air; this is due to oxidation of bilirubin to biliverdin, and has no significance. Brown stools are normal when the diet includes rather a high proportion of proteid to fat, as in diets of skimmed milk, whey, malt soup, or when beef juice or maltose have been added to the food.

Gray stools owe their color to undigested fat. This may be due to excess of fat in the food, or to lack of bile with normal food. The gray stool is apt to be large and is often putty-like in consistency.

White stools contain curds, undigested fats and soaps.

Green stools vary considerably in tint, from the light yellowish color due to biliverdin, found in the normal stool after exposure, to the very dark green in stools during acute indigestion, with fermentation. This color is often due to the presence of a bacterium, present in fermenting carbohydrates.

Black stools follow the administration of bismuth, or iron. Black stools of tarry consistency are usually due to partially digested blood, and indicate hemorrhages high in the gastro-intestinal tract, or blood swallowed, derived from other sources.

**Curds.** The nature of the curds, when present, may be important. Casein curds are formed from caseinogen of milk, which is precipitated by rennin in the presence of lime salts. The rennin splits the caseinogen into two parts, one of which is dissolved and is one of the whey proteids, while the other combines with the calcium and inmeshes the fat globules, forming the milk curds. These are tough; cannot be broken by pressure; are not soluble in ether; are white or pale yellow in color; harden greatly in formalin; and are rather large in size. The milk curds are smaller in human or goat's milk than in cow's milk. Excess of protein in the food is to be suspected when these are present. Fat curds are smaller than milk curds, varying from the size of a pinhead to the size of a pea. They are composed of fat combined with sodium, potassium or calcium, forming soaps. They are soft, easily crushed by pressure, are soluble in ether; do not harden in formalin; and are whitish, yellowish or greenish in color. Fatty curds always indicate excess of fat in the food, as measured by the infant's capacity for digesting fat.

**Blood** in the stools is always seriously pathological. When it appears as a streak of fresh blood, it suggests a local lesion near the anus, usually a fissure. When the blood is mixed with mucus, in flecks varying in tint, ileo-colitis is to be suspected. When the blood and mucus are intimately mixed, especially in the absence of true fecal material, intussusception should be suspected. When the blood is hemorrhagic in origin, and is partially digested, a blackish, tarry mass is present.

When blood is not recognizable on macroscopic examination, it may be recognized by microscopical or chemical examination. The guaiac test is most commonly used; there are several others of varying delicacy and accuracy.

**Pus**, when recognizable microscopically, always indicates a severe lesion of the intestinal tract; usually rather low in the colon or in the sigmoid or the rectum.

Undigested masses of food may sometimes be found. Articles which have been swallowed may be found by inspection.

**Parasites.** Round worms or pinworms are not rare. Segments of any of the tapeworms may be found. Hook worms may be recognized by close inspection; they are about one half inch long, and are of a comma shape. Amebac are rare in infants, but in some parts of the country are rather common in children fed vegetables or vegetable juices.

**Bile pigments** are normally present; their absence may be of importance. Several chemical and micro-chemical tests may be employed for their recognition and differentiation.

**Mucous stools** are found in diarrheic conditions, in colitis, and in the "hunger stool" produced after food has been refused for a day or more. They are present also in acute intestinal obstruction, however caused.

**Microscopical** and chemical examination of the stools must be made in the laboratory, and the text books of laboratory diagnosis give the technical procedures in full. Micro-organisms, ova of parasites, undigested food remnants, fat globules, pus, blood, fatty acid crystals and other crystals, mucous particles, desquamated epithelial cells, intestinal sand of various types, all may be found rather commonly in the various gastro-intestinal diseases, and they may explain functional neuroses and certain other less common pathological states.

**Ferments** present in the stools include the digestive enzymes. In cases of difficult diagnosis, these may be isolated and any deficiencies recognized. The enzyme reductase is present in normal stools. A fresh mass of feces, mixed with sterile water and an alcoholic solution of methylene blue should then be incubated at 37 degrees C. for twenty to forty minutes. Normally the methylene blue is completely decolorized within that time. In fatty diarrhea and under several abnormal diets the reductase is diminished or absent. In alkaline fatty stools reduction may be very greatly hastened.

**Bacteria** are absent from the gastro-intestinal tract at birth, but enter by the mouth, and at the end of twenty-four hours are found in all parts of the intestinal tract.

The bacteria in the meconium are derived from the inspired air, and vary somewhat with the surroundings.

In the breast fed infant, the bacteria found in the intestinal tract, are: *B. coli*, *B. bifidus*, *B. acidophilus*, and *B. lactis aerogenes*.

When children are fed on cow's milk, the flora is more complex, being made up of various types, namely: *B. coli*, *B. acidophilus*, *B. lactis aerogenes*, and intestinal cocci, no one type dominating, most of them being facultative putrefactors. Germs of the first class, *B. bifidus*, and *B. lactis aerogenes*, are fermentative, and break up milk sugar into lactic acid and gases, giving an acid reaction to the stool, while *B. coli* and proteolytic bacteria decompose proteins, and give an alkaline reaction to the stool.

The intestinal flora departs in a uniform manner from the normal, in certain cases of intestinal intoxication with malnutrition, by the establishment of predominantly putrefactive types of bacteria. A balance of the two types is again noticed as the case returns to normal. Such changes can be brought about by withdrawing the animal protein, and increasing the amount of carbohydrates, lactose and dextrose being the most effective in establishing a fermentative flora in the intestinal tract.

The reaction of different media is found to have a marked effect on the growth of intestinal bacteria—slight degrees of acidity having an inhibitory action, while slight alkalinity encourages bacterial growth. The grampositive bacilli (*B. butyricus*, *B. acidophilus*, *B. bifidus*) disappear with slight alkalinity, and with strong alkalinity only the gram negative flora remains, (*B. lactis aerogenes* and *B. coli*). In acid reactions strepto bacilli do not thrive so well, but they are the last kind of bacteria to survive. From the reaction of the stool, some conclusions can be drawn as to the nature of the intestinal flora.

The use of alkalis to preserve milk may do harm, as it encourages the growth of *B. coli* by preventing lactic acid formation.



## CHAPTER XXIII

### INTESTINAL WORMS

Four types of intestinal worms are found in children but only two of them are of frequent occurrence. The four types are:

Threadworms (*oxyuris vermicularis*)

Roundworm (*ascaris lumbricoides*)

Tapeworm.

Whipworm (*trichocephalus*)

The presence of worms in children is much less common than is usually supposed. An excess of carbohydrate food gives all the symptoms usually ascribed to worms, by parents, and this diet should be first suspected when such symptoms occur. The method of infection varies with the varieties of worms, and it is only by understanding the methods and the life histories of the worms that children can be protected from them.

The threadworm is the most common. It is found in many children and is difficult to dislodge. The ova are taken into the system through the mouth and probably multiply in the intestines. They are rarely found in the small intestine but are common in the rectum and colon and are found at the caecum and in the appendix. An enormous number of these worms are passed by some children and they may continue to be passed for weeks and months despite all treatment.

**Beef tapeworm, *tenia saginata*,** results from eating raw, or rare, infected beef. The cysticerci are digested in the stomach, leaving the scolex free. It may be digested also, in which case no harm is done. It may live to reach the intestine, when it attaches itself to the wall of the small intestine and begins to grow. It reaches maturity in about three months, but may remain much longer. The segments are passed into the bowel contents, and voided with the feces. If the fecal material contaminates grass or other vegetables, cattle may eat the ova with the green leaves, and thus become infected; the capsule is digested in the stomach, the onchosphere is set free; it passes through the intestinal tract and finally becomes lodged and encysted in the muscles. If cattle so infected are killed and eaten, the entire process is repeated. If alternating series of hosts, herbivorous and carnivorous, fail in any particular the life history of the worm is terminated. If children are never permitted to eat raw or rare beef, this tapeworm cannot possibly gain entrance into their intestines.

**Pork tapeworm, *tenia solium*,** is rarely found in children. It results from eating uncooked or poorly cooked pork or sausage. Pork so infected is rather easily recognized, since the cysts are

larger and more abundant than are the cysts in beef. The name "measly pork" explains the appearance of such meat.

**Tenia cucumerina** results from playing with dogs or cats. A louse which infests these pets is the intermediate host; children get the microscopic ova or larvae upon their hands, thence into the mouth, and the further history is that of other tapeworms. This worm is only six inches to twelve inches in length.

**Dibothriocephalus latus** rarely affects children. It is found also in dogs and cats. The intermediate host is one of several varieties of fish. It produces some peculiar and virulent toxin, and this causes very severe anemia, often confused with pernicious anemia, and characterized by marked eosinophilia.

**Tenia nana** is the smallest and the most abundant of the tapeworms. It is less than an inch in length, and may contain two hundred segments. Hundreds of these worms may be passed. The intermediate host is unknown. It is found in rats as well as in human beings; and in similar form. It may reach children from rats by way of cats, which are pets.

Other tapeworms are rarely found in children, but are more often found in adults. They present no characteristics of interest.

**Round worms, ascaris lumbricoides**, are commonly found in children, especially between the third and the tenth years of life. They are usually rather abundantly present, sometimes hundreds may be found in one child. These worms are five to ten inches long, and resemble ordinary earthworms. They wander around the body in a strange way; they may enter the mouth, nose, or Eustachian tube; they may pass through an open Meckel's diverticulum and thus through the umbilicus; they may, rarely, penetrate the walls of the intestine and cause fatal peritonitis; they may enter the pancreatic duct or the bile ducts and they may cause fatal involvement of these structures. The ova pass into the feces in thousands daily. These are microscopical in size, and are easily allowed to reach the fingers and the food of children, whence successive infections in the same child, or in other children.

**Pin worms, oxyuris vermicularis**, are rather less commonly found in this country. The female is about one-third of an inch long; the male is about half that length, but is rather rarely found. They look like short bits of white thread, and are present very abundantly. This worm is of ancient history, having been recognized and described in very early times. The worms and the ova are discharged in the feces by millions, and thus re-infection is easy. Contaminated water or uncooked vegetables carry the microscopic ova abundantly. The worms and ova are usually easily found in the feces.

**Hookworms, Uncinaria Americana**, are found in the southern states more frequently; rarely the parasite is found almost any-

where in the United States. It gains entrance to the body, usually, by way of the skin of the feet, thence the larvae are carried by the blood to the lungs, thence they may migrate or be coughed up into the mouth and be swallowed; reaching the intestine they develop into the adult worm. Thus the two stages of existence occur in the human body, instead of occurring in intermediate hosts. They do not multiply in the intestine, but reinfection is usually abundant. The ova are discharged with feces, and these, in turn, contaminate the ground. This worm causes anemia and great weakness.

**Diagnosis.** In all forms of worms, diagnosis is somewhat difficult unless the ova or the worms or their segments can be found in the feces. Various symptoms of gastrointestinal disease, such as colicky pains, capricious appetite, diarrhea or vomiting may occur, and these may lead to a suspicion of worms. Round worms cause various nervous symptoms. Pin worms cause marked pruritis. *Dibothriocephalus latus* and hook worm cause marked anemia and weakness. But the chief factor in diagnosis is the finding of the worms or their segments or ova in the fecal material; this is of great importance.

The symptoms of threadworms include: Colicky pains in the lower part of the abdomen and in the umbilical area, loss in weight, enuresis, itching of the anus and nervousness.

Under the head of nervousness is a group of symptoms which include: disturbed sleep, grinding of the teeth, night terrors, morning headache, choreiform movements, timidity.

Picking of the nose and facial expression are of no particular importance in reaching a diagnosis of worms. In fact there are no symptoms which are not to be found in intestinal indigestion. Positive diagnosis is made by finding the worms or ova in the stools.

**Treatment.** For any type of worm, the following procedure may be employed. Fast the child 12 to 48 hours, giving water freely. If weakness is not too great, keep the child fasting longer. Give very heavy osteopathic treatment through lower thoracic and lumbar region, with heavy springing of the spinal column and raising of the ribs. Care is to be used, as usual in treating children, but the treatment must be such as to affect profoundly the lower thoracic and the upper lumbar centers. Raise the ribs over the liver, give stimulating manipulation to the liver, with deep treatment over the gall bladder and the course of the bile duct.

After the treatment, give the child plenty of water, hot or cold or alternating. If he is very weak and hungry, he may have food, preferably raw vegetables or fruit. If he is not too weak, let him fast 12 to 24 hours longer, giving plenty of water, and if greatly desired, orange, grape fruit or lemon juice, or he may have raw apples or other fruit. An enema then should bring the worms in abundance; if not, the diet of foods rich in cellulose should be maintained for several days.

If this procedure is not efficacious, further methods may be employed.

This consists of an attempt to rid the intestinal canal of the worms. This is best accomplished by colonic irrigation. A large amount of solution should be used. A normal salt enema, given in the knee chest position, is valuable as an initial treatment. This should be followed with mineral oil, given in one drachm doses three times a day.

The hands should be kept clean as the ova are frequently transferred from the anus or vulva to the mouth by the unclean hands of the children.

For tapeworms, give a dose of castor oil or other laxative, followed the next day by a drachm of liquid extract of male fern. This should be followed in two hours by a strong purgative. Liquid diet for two days increases efficiency of the male fern.

The whip worm is rare. Only three or four are found in a child. Symptoms are like those in cases of thread worm. Treatment is similar to that for thread worms.



## CHAPTER XXIV

### OTHER DISEASES OF DIGESTIVE ORGANS APPENDICITIS

Infants and small children rarely suffer from appendicitis. Boys from five to fifteen years of age have appendicitis almost as often as do adults; girls are much more rarely affected. Probably the greater frequency of injury accounts for the greater frequency of appendicitis in boys.

**Etiology.** Lesions of the tenth thoracic to the second lumbar vertebra are known to predispose to infection; this has been indicated by both clinic experience and animal experiments. Intestinal worms may cause inflammation, by their presence. Direct trauma, such as a blow upon the abdomen or a fall with injury to the abdomen, certainly plays a part in etiology, in certain cases. Hard objects, concretions or hard substances from the food, may be found in the appendix; the etiological importance of these is probably negligible.

Bacteria play a part, though no specific organism can be mentioned. The colon bacillus, streptococcus, staphylococcus (either albus or aureus), pneumococcus, gonococcus, bacillus aerogenes, bacillus pyocyaneus, and other pyogenic organisms may be found in the pus, either singly or in combinations. Certain infectious diseases, especially typhoid fever, seem to predispose. Heredity plays a part, probably due to an inheritance of structural peculiarities which interfere with drainage of the appendix.

**Pathology.** The tissue changes follow about the same course as that observed in adults in fatal cases,—catarrhal inflammation, marked edema, round celled infiltration, infection and development of pus, with foci varying in size and location, finally perforation or gangrene or both, and death. This process may be stopped at any time by recovery. No permanent injury usually results if recovery occurs before perforation or peritonitis. There may be infection of the peritoneum without perforation; in this case, or after perforation, varying adhesive bands may be formed which produce abnormal conditions during later life.

**Diagnosis.** Symptoms are rather vague in early childhood. In older children, the picture typical of appendicitis in adults is present; the diagnosis is then made without great difficulty.

Localized pain and tenderness may be hard to determine; children really are unable to localize pain so well as are adults, and little children are unable to understand questions or to give intelligible answers. Muscular rigidity is present in any abdominal

inflammation, in children, as is also the drawing of the legs. Fever is usually higher in children than in adults. Abdominal distention is present in this, as in other abdominal diseases of childhood. Constipation, diarrhea or normal bowel action may coexist with appendicitis. Vomiting is almost always present. Paroxysmal crying is usual.

Leucocytosis is usually more marked than in adults, often reaching 20,000 or 30,000, with a polymorphonuclear percentage of 90 to 98. It must be remembered that in children there is a relative and varying preponderance of hyaline cells, so that the differential count must be considered in connection with the counts normal for the age of the patient. Eosinophiles are almost or quite absent. These findings are absent in weak children, or great prostration. The urine contains acetone and usually albumen, renal epithelium and casts, as in mild, acute nephritis.

The diagnosis is usually difficult. The sudden onset, severe vomiting, abdominal distention, fever and leucocytosis, when present, render the diagnosis fairly certain, in the absence of symptoms characteristic of other diseases. Pneumonia, colic, indigestion, psoas abscess, cyclic vomiting, may all be confused with appendicitis. Careful and persistent examinations, with consideration of these various possibilities, are necessary for diagnosis, which may, even with the greatest care, be impossible.

**Treatment** is practically the same for children as for adults. Rest in bed is essential. The bowels must be well emptied, whether normal bowel action, constipation or diarrhea is present. Cathartics are to be avoided. Daily enemas are necessary in most cases.

Correction of lesions, raising of the lower ribs, relaxation of spinal tissues through the thoracic and lumbar region, must be accomplished by means of extremely gentle manipulations. Spinal inhibition in the region of greatest muscular tension gives relief, lessens fever, and promotes recovery. If abdominal pain is severe in the intervals of treatment, an ice bag, covered with woolen cloth, gives greatest relief. Thin cotton may be interposed over the skin, if the wool is uncomfortable. If the ice bag is not comfortable, sometimes the application of heat relieves the pain. Damp heat is usually better than dry heat, in these cases.

A conservative and sensible surgeon should be in consultation, and it must be remembered that surgical interference may become necessary at any time.

Sudden relief of the pain and vomiting, lowering of the fever, increase in appetite and apparent health, very often signifies a ruptured appendix. The mother or nurse should be advised of this possibility, and should be instructed to send at once for the doctor when such sudden relief occurs. If the operation is not performed

speedily, the fever increases, peritonitis sets in, and death is usually inevitable. With immediate surgical treatment, recovery should be uneventful.

### PROCTITIS

In children, inflammation of the rectum is almost always associated with inflammatory processes of the colon, and usually of the ileum. Occasionally proctitis is found alone.

**Etiology.** Lesions of the third to the fifth lumbar vertebra are always present in cases in which healing is delayed, or in those cases in which comparatively negligible irritation causes greater than logical effects.

Pin worms cause proctitis by the irritation due to their presence. Careless manipulations, especially the giving of enemas with a hard tube, carelessly inserted; awkward attempts to dilate the anus; the passage of hard stools; and the use of irritating suppositories are mechanical causes. Infections, such as those present in the acute exanthemata, or gonorrheal infection from the vagina, or from the use of toilet articles, enema tubes, etc., infected by other persons, or direct infection by fingers carrying diphtherial, syphilitic, or other infections, may cause severe and localized proctitis. Ulcers and erosions result from infection or from the passage of hardened stools over the inflamed membrane. Secondary infections, such as streptococcus or staphylococcus or other pyogenic organisms, may result in the formation of deep abscesses.

The inflammation may be catarrhal, ulcerative, or membranous, according to the nature and the severity of the etiological agents. These types are characterized by the same pathological changes as similar inflammations of mucous membranes anywhere in the body.

**Diagnosis.** The condition may remain unsuspected, when a baby cries and is unable to explain the location of the pain. Occasionally there is subnormal sensation in the anal region, and the child is not aware of the location of the pain; he is simply uncomfortable, cross and fretful without recognizable cause. In other cases the pain may be definitely localized and very severe.

Bleeding may be slight, with only a small line of blood upon the stool, or very severe, with the passage of liquid and clotted blood in large quantities. Mucous stools may be present; or the stool may be coated over with tenacious mucus.

Examination with a proctoscope is the only definite method of determining the location and extension of the diseased area.

**Treatment** consists, first, in correcting the lumbar lesions, and in the relaxation of neighboring tissues, when these are contracted or edematous. Relief of the local conditions is best secured by injecting some bland material into the rectum,—rice water, starch water, oil or vaseline. In membranous proctitis normal salt solu-

tion, or very mildly alkaline solutions, are preferable. Constant irrigation by means of a two-way catheter may be used. Ulcers may require local treatment with weak silver nitrate or argyrol.

If ischiorectal abscess results from this, or similar conditions, evacuation of the pus is required. This condition is rare in childhood, and the diagnosis and treatment are the same as in adults.

### ACUTE PERITONITIS

Acute peritonitis occurs during intrauterine life, or at any time after birth. Frequent during the first few days of life, it is rare during infancy, but after weaning, especially after the age of about three years, it increases in frequency.

**Etiology.** Very early in life, it is due to infectious agents which gain entrance into the abdomen by way of the umbilicus. Later in infancy trauma plays some part. Severe burns anywhere in the body are often followed by peritonitis.

Infection is probably always present. Pneumococcus, streptococcus, colon bacillus, these are the more common infections, but any pyogenic organism may be found.

The spread of inflammatory processes from appendicitis, ulcers of any part of the gastrointestinal tract, vaginitis, empyema in which the diaphragm has perforated, areas of intestinal obstruction however caused, or from Pott's disease,—these are among the more common sources of infection. Blood-borne infection occurs sometimes in pneumonia, and in any of the other acute infectious diseases.

**Pathology.** Several different types are found. The sero-fibrinous form is the least serious. The peritoneum is congested and abundant amounts of liquid rich in fibrin are thrown into the peritoneal cavity. There may be localization of the inflammation, and this fibrinous exudate limits the process. In generalized peritonitis almost or quite the entire peritoneum, parietal as well as visceral, may be concerned in the inflammatory process. Adhesions are formed, by means of which the intestines, folds of the peritoneum, the solid abdominal viscera and the abdominal wall are variously bound together in masses or by means of bands of newly formed connective tissue. These adhesions are tender and easily broken up at first, but soon become firmer; they may cause very great trouble later.

In the purulent type the exudate includes pus as well as bloody serum. Varying areas of pus accumulations are formed within the loops and folds of the peritoneum, especially in the mesentery between the intestinal folds. Large accumulations of pus are most commonly found in the iliac fossa or in the pelvis; these abscesses may open into the rectum, vagina or bladder, or upon the surface, usually near the umbilicus. After drainage, the cavity may fill



with granulation tissue, if the patient lives. Adhesions are very dense and abundant, and are apt to cause much trouble later.

**Diagnosis.** The symptoms are serious from the onset, in children; in infants the diagnosis may be very difficult. The onset of peritonitis is sudden, though there may be already present the infectious diseases already mentioned as being of etiological importance. Vomiting, first of the food last swallowed, then of thin, greenish, sour, bitter liquid, often containing bile, may be very severe. The temperature rises rapidly, often to 105° or even more, in fatal cases. Older children complain of severe pain in the abdomen; great tenderness is present. The abdomen is greatly distended and the walls are rigid. The thighs are flexed; breathing is difficult; any disturbance increases the suffering; constipation is almost always marked; retention of urine is common; and the child is evidently really very ill. Prostration is severe; small, rapid pulse, hicough, clammy sweating, and perhaps convulsions; these are fairly common but not invariable symptoms.

The urine shows albumen, casts, renal epithelium, indican, and sometimes abundant pus and blood. The blood shows leucoeytosis, if the resistance of the child is not speedily overcome by the severity and the suddenness of the attack. The differential count shows 85% to 98% of polymorphonuclear neutrophiles. The blood is always concentrated on account of the abundance of the exudate.

In cases of peritonitis associated with pneumonia, the pain and the swelling of the abdomen may be the only symptoms noted. Localization is rather frequent, and recovery may occur.

Localizing symptoms may be characteristic, or may be very vague.

**Appendix abscess** is recognized by preliminary symptoms of appendicitis, and by the presence of a very tender, doughy or resistant mass in the right iliac region or the right side of the abdomen higher than the location of the appendix.

**Subphrenic abscess** is usually due to pneumonia of the lower lobe of the right lung, but may follow abscess of the liver or the appendix. The pus, between the liver and the diaphragm, may be remarkably abundant. The symptoms are more like those of empyema, with which the diagnosis may be confused.

**Pelvic peritonitis** is very rare. Rectal examination usually shows a resistant, very tender mass within the pelvis.

**Perinephritic abscess** presents great difficulty in diagnosis. Reflex tenderness is more definitely located at the eleventh and twelfth thoracic segments than when the intraperitoneal organs are involved. A resistant, tender, sometimes doughy mass in the flank may be definite enough to suggest the correct diagnosis.

The X-ray plate may give the location of the pus very accurately, and such examinations should be made several times during the first week, if this can be done without disturbing the patient.

**Treatment** of acute peritonitis is not very satisfactory. Inhibition of the lower splanchnics and the upper lumbar centers gives relief to the pain and diminishes the fever, at least temporarily.

Lesions should be corrected by gentle manipulations.

Dry cold is best in most cases. Occasionally this increases the pain, and hot packs give relief; they must be very hot, must not burn, and must be steamy.

A cage should support the bedclothes over the abdomen.

Purgatives are absolutely forbidden. Enemas of normal salt solution, made faintly alkaline with sodium bicarbonate, keep the bowels well cleansed, supply water to the system, and maintain normal alkalinity. The Murphy drip or continuous irrigation by means of the two-way colon tube in older children, or a two-way soft rubber catheter for babies, accomplishes the same end even more efficiently. Violent intestinal activity is to be most carefully avoided.

Gastric lavage may be necessary to stop the vomiting, after the stomach has been fairly well emptied. Inhibition of the upper splanchnic centers may relieve the vomiting more speedily.

Food may not be retained on account of the vomiting. Babies may be given their usual food, diluted to about one half the usual strength. Older children must be refused solid food, and may be given albumen water, broths, or skimmed milk, which may be diluted with ice water. Small bits of ice in the mouth may provide water which is retained when drinking is impossible. During the most acute stage rectal feeding is indicated; intravenous injections of glucose may be required.

**Surgical interference** may at any time become urgently necessary. Arrangements should be made so that this can be done quickly at any time.

Localized pus should be evacuated as soon as this can be done. Drainage of the abdomen may occasionally be required, even if localizing symptoms are absent. The surgeon should be in consultation, and his advice considered. Laparotomy and washing of the abdominal cavity with abundance of normal salt solution is sometimes advised as an early measure.

Opiates often seem to be demanded by the severity of the pain. In cases which are evidently fatal, the use of opiates is advisable. Otherwise, they are best avoided. Recovery may be impossible when opiates are used, when otherwise it would have been quite possible. Chloral is advised for the relief of the pain; while less

dangerous than opiates, it is yet capable of diminishing the possibility of diagnosis and the ability of the child to recover.

**Shock** is best treated by hot packs or hot water bottles. Stimulation of the splanchnic centers is indicated. Hot alkaline irrigations give relief; glucose solutions may be used in the same way. Intravenous injections of hot glucose solutions are advised in very serious cases. Certain French authors use very high temperatures for these intravenous injections; American authors usually advise 110°F. at most.

**Prognosis.** The outlook is always doubtful. Infants usually die within the week. Older children may survive comparatively mild attacks. Peritonitis complicating pneumonia is most hopeful of all cases of peritonitis, but the co-existence of peritonitis increases the probability of death in pneumonia.

### CHRONIC PERITONITIS

During fetal life chronic peritonitis is usually due to syphilis, but may be due to the other causes active after birth. Adhesions and intestinal malformations are often due to the adhesions resulting from acute or chronic peritonitis during fetal life.

Tuberculous peritonitis is the most common of the chronic forms; this is discussed in the Part dealing with Tuberculosis.

Acute peritonitis may subside into the chronic form, and the adhesions left by the acute inflammation slowly increase in extent and in thickness.

The peritoneal abscesses of the acute form may remain as a chronic purulent peritonitis. The pus slowly undergoes digestion and absorption; granulation tissue slowly heals the wound, and many very dense adhesions remain.

Chronic localized peritonitis may be associated with disease of any of the organs covered by peritoneum.

None of these forms of peritonitis are common.

Unless ascites develops, the symptoms are those of the causative disease, or are so vague, and present so many characteristics common to other abdominal disturbances that diagnosis is practically impossible.

**Ascites** results from the inflammatory conditions in certain cases. The gradual swelling of the abdomen is usually the first symptom suggesting peritonitis. Pain is absent or slight, much less than in the peritonitis of adults. Occasionally slight evening fever, slight anemia, slight emaciation and weakness, slight diminution of appetite, are noted. Physical examination shows the ascites.

The usual course of the disease is very slow. The liquid may be absorbed during the course of several weeks or months. In other cases the liquid is not absorbed, and the child ultimately dies from exhaustion, or from intercurrent disease.

**Treatment** includes very gentle raising of the lower ribs, and the very gentle correction of any lesions which may be found which interfere with the circulation or the nutrition of the child anywhere. Rest in bed is indicated, if this is possible without causing too great restlessness.

If the fluid is not absorbed within due time, or if the accumulation is so great as to cause pressure symptoms, paracentesis is necessary. It may be performed many times, and yet the child ultimately recover. Laparotomy should be performed and the abdominal cavity flushed with sterile, warm, normal salt solution if paracentesis is necessary for more than a few weeks.

The prognosis for life is fairly good, with proper care. The adhesions and the presence of the causative factors prolong convalescence and lead to various types of digestive disorders during later life.

### CHYLOUS ASCITES

This condition is rare in childhood. The ascitic fluid is milky in appearance, due to the presence of many fatty globules. Its cause is unknown; always the evidences of chronic peritonitis are present, and this may or may not be tubercular.

Disturbance of the lymphatic drainage, fatty degeneration of the ascitic fluid, and partial digestion of the abdominal fat are the factors suggested as being concerned in pathogenesis, but the essential changes concerned have not yet been determined.

The total amount of fluid may be extremely large. Treatment is that of the chronic peritonitis with which it is always associated,—either tubercular or non-tubercular. The prognosis is more grave than in the ordinary non-tubercular type.

### FOREIGN BODIES

The old saying that “A baby has a place for everything and puts everything in its place” is very true. Babies and small children have most unfortunate habits of putting many improper things into the mouth and swallowing them.

Smooth objects usually pass through the gastro-intestinal tract within four days to two weeks, but this time may be very considerably extended. Pebbles, marbles, smooth detached parts of toys and smooth objects secured from the house anywhere seem to cause little or no trouble, provided they are not large enough to obstruct respiration. A thimble or similar object, lodged in the throat, may cause death from suffocation.

Pins, needles, open safety pins, sharp bits of metal or bone, fragments of glass, toy knives or forks, are safely passed through in a surprisingly large number of cases. Perforation does occasionally occur, with death, but the numbers of such deaths is distinctly small when the amount of such material swallowed is considered.

The swallowing of a sharp or rough object may cause pain in the pharynx, rarely in the esophagus, and almost never is there any pain in the stomach or intestines unless perforation occurs. At the anus any rough or large or sharp object may again cause pain.

The X-ray is the only helpful factor in diagnosis,—except the passing of the object in the fecal mass. In cases of suspected swallowing of harmful objects, the X-ray should be employed at once. If the object is found, its further history should be watched at intervals by the X-ray until it is finally eliminated from the body. At any indications of harm, or of injurious local effects, the object should be removed by surgery.

It is very important to avoid surgery so long as no injury is resulting from the presence of the foreign body.



**Treatment**, so long as no definite harmful local effects are found, is simple. The child should be given much soft food, such as coarse cereals, cooked vegetables, mushes, soups, etc., which leave a large, soft residue. Thus the intestinal wall is padded, and the object is at all times thickly surrounded by the soft material. Purgatives and emetics are to be very definitely avoided. If constipation occurs, enemas are harmless.

### Hairball

In quite a different class is the voluntary swallowing of irritating substances. Neurotic children and children who are improperly fed occasionally swallow lint from clothing, hair from their own or others' heads, fur from rugs or clothing, and other fiber-like substances. This material may be vomited, or may traverse the entire intestinal tract, or may accumulate in the stomach, or, more rarely, in the intestines. In this way the "hair ball" may be formed.

The diagnosis of the hair ball is often difficult. The tumor may be easily found, or may escape palpation. There is some pain in the epigastrium, but this is not pathognomonic. The children are not normal else the hair ball would not be formed. Nutrition is poor. Rarely is the condition recognized until it is passed with feces, or is vomited, or is found at a surgical operation performed for tumor, impaction, or some other condition. It is not visible in an X-ray plate.

If the ball is removed by catharsis, the further swallowing of hair, etc., must be prevented. By changing the diet, usually by adding much fresh vegetables and fruit, the perversion may disappear. Watchfulness may be necessary for a time. If the ball is removed by surgery, the tendency to recurrence is much less, though it is not safe to trust to this factor; after surgery, the children should be watched also. The diet should be corrected in all cases, and whatever measures are required for the relief of the neurosis should be taken at once.

## CHAPTER XXV

### DISEASES OF THE LIVER AND PANCREAS

The functions of the liver and the pancreas are constant during life. Both glands are innervated by the vagus and also by the middle splanchnic nerves. Lesions of the cervical vertebrae, or the seventh to the eleventh thoracic vertebrae, or of the lower ribs, affect the innervation of the glands and also of their blood vessels. Functional disturbances of the liver and the pancreas are known to occur in animals as the result of experimental lesions of the spinal areas mentioned, and clinical evidence gives further evidence of the great importance of these bony lesions in the etiology of diseases of both glands. It must be remembered that such lesions disturb the innervation of the gland cells and thus interfere with correct activities; that they also interfere with the innervation of the nutrient vessels, and thus interfere with the supply of oxygen and food materials, and also with the drainage of the katabolites from the active cells. These disturbances are in turn responsible for congestions, toxic effects and malnutrition; these in turn lower immunity and permit infection to occur from the presence of pathogenic organisms otherwise too few in number to overcome the normal resistance of the body. These factors are true, in some degree, of all the tissues of the child's body, but it is especially true of these two large and active glands, the pancreas and the liver.

#### FUNCTIONAL HEPATIC DISORDERS

It is difficult to distinguish between functional hepatic disorders and gastro-intestinal diseases in which the liver is also affected. Probably the liver is always affected by the gastro-intestinal diseases to some extent, at least. The liver may be affected primarily, and, as the result of its malfunction, gastro-intestinal symptoms be produced.

**Etiology.** The bony lesions already mentioned are known to disturb the circulation through the liver and to diminish the secretion of bile. Sugar-metabolism is disturbed by these same lesions, but it is not yet known whether this is due altogether to the pancreatic disturbance or whether the glycogenic functions of the liver are also affected.

Improper diet unquestionably affects the liver; this is especially true of excess of carbohydrates, and especially of the excessive eating of candy. The use of alcohol is not now a common cause of hepatic disease, though children have been occasional sufferers from this cause.

**Diagnosis.** The symptoms are indefinable. Constipation; pale stools, or stools colored but not containing normal bile derivatives; a

sallow or slightly icteric skin; dull eyes, with yellowish conjunctivae; occasional nausea and vomiting without other recognizable cause; dull, heavy headaches, varying and without other recognizable cause, some restlessness at night, irritable temper, diminished mental vigor, all these are due to hepatic disorders which may or may not be functional.

The liver is usually slightly increased in size, though this is not always recognizable on palpation. The spleen is not usually palpable. The blood serum contains a trace of bile. The urine does not usually contain bile in functional hepatic disturbances, and the presence of bile in the urine should lead to suspicion of catarrhal cholecystitis or other liver disease with definite pathology.

The finding of the bony lesions mentioned does not restrict the disease to the functional types; some of these are of etiological importance in the other type of hepatic disease also.

**Treatment** depends in part upon the etiological factors. Correction of the lesions as found is important. Raising the ribs over the liver, and the use of such exercises as maintain normal respiratory activities of the lower ribs, are useful. Manipulation of the gall bladder and relief of any tension or edematous areas which may be found in the region of the gall bladder is helpful.

Diet must be corrected. Excess of carbohydrates, especially candy, must be immediately and thoroughly eliminated. The sugar content of the food should be diminished for two days; then returned to a correct normal. Fats should be withheld for two days, then returned slowly to normal. Older children must be given correct food at regular intervals. Plenty of water, fruit juices and vegetable broths are to be given babies and older children. Older children may also be given raw and cooked vegetables, with due regard to the danger of giving too much roughage.

**Prognosis.** With correct treatment, functional disturbances are soon eliminated. If they persist, the liver suffers from cirrhosis or some other of the diseases with definite pathological changes.

## ORGANIC DISEASES OF THE LIVER

**Congestion** of the liver may be either active or passive. Active congestion results from bony lesions of the eighth to the tenth thoracic vertebrae, and from the eating of too much food, or food too rich in sugars and fats. Starches are less rarely of etiological importance.

Passive congestion results from cardiac inefficiency, chronic pulmonary disease or malaria; rarely other causes of obstruction of the venous drainage result in passive congestion.

Symptoms are vague and diagnosis is difficult. The treatment depends upon the relief of the cause of the obstruction.

**Catarrhal cholecystitis** (catarrhal jaundice; obstructive jaundice; icterus of intestinal origin). This disorder is a mild, acute catarrhal inflammation of the bile ducts, usually following catarrhal duodenitis. Inflammation of the duodenal membrane itself may cause an obstructive jaundice, but it is probable that in all cases sufficiently prolonged to cause jaundice, the inflammatory process involves the bile ducts. This disease is rare in children.

The symptoms are characteristic. Some indigestion initiates the attack, sometimes so slight as to attract no attention; sometimes severe vomiting, constipation or diarrhea, and fever; and within a day or a few days jaundice develops. This is not so profound as the jaundice seen in adults with the same disease, but it does not disappear more rapidly.

The urine contains bile, sometimes this is found before the jaundice is noticeable. Headache and malaise are present; the itching and bradycardia so often noted in adults with jaundice is much less common in children. This series of events is diagnostic. Since the disease does not occur in early infancy, there is little danger of confusing it with congenital abnormalities.

Treatment includes the correction of any bony lesions found, raising the ribs over the liver; daily enemas; free drinking of water and fruit juices; a bland, nonirritating diet, free from fats or sweets; and, if necessary, other measures for the relief of the vomiting or diarrhea, for which see the discussions of these symptoms.

**Hemolytic Jaundice** (Infectious jaundice) may occur at any time during an acute infectious disease. It appears to be due to a clogging of the hepatic vessels with the products of the disintegration of erythrocytes, or to the clogging of the bile capillaries with the thickened bile resulting from the excess of hemoglobin derivatives present when great numbers of erythrocytes are destroyed. Pernicious anemia may cause a similar type of jaundice, or the anemia due to the action of hemolytic streptococcus.

The occurrence of jaundice during the progress of an acute infectious disease, or any severe anemia, should lead to the diagnosis. The treatment is that of the disease already present, plus the treatment already outlined for catarrhal jaundice.

**Acute yellow atrophy** is rare in childhood. Acute infectious diseases, syphilis, and chloroform poisoning have been mentioned as causes. The disease begins as a catarrhal jaundice, which speedily becomes very serious. The liver diminishes in size, bile, tyrosin and leucin are found in the urine; high fever, convulsions, delirium and coma occur within two or three days, and death is inevitable.

**Treatment** can be devoted to the relief of the symptoms, as given under vomiting, fever, and convulsions, with some prospect of success, but death is inevitable within a few days.

**Cirrhosis of the liver** is also rare. The acute infectious diseases, alcohol, chloroform, syphilis, malaria, tuberculosis, passive congestion of the liver from whatever cause, all have been mentioned as of etiological importance. Infants in tropical countries suffer from this disease, for which no other cause than the climate can be found.

The atrophic or portal cirrhosis shows diminution of the liver from the first; the biliary cirrhosis shows first an increase, then a diminution in size.



The pathological changes in these, as also in the form due to passive congestion, are those described in ordinary books of pathology.

The disease begins with mild digestive symptoms,—vomiting, nausea, diarrhea, all rather mild and occasional; after a week or more emaciation, ascites, dilatation of the abdominal veins, enlargement of the spleen arouse suspicion of the nature of the disease. The liver may enlarge and become atrophic later, or may remain large. In the atrophic form jaundice is absent or slight; in the hypertrophic form jaundice is profound. Subcutaneous or submucous hemorrhages may occur; in which case the diagnosis is easy.

Treatment is of little avail, except for the relief of symptoms. A mild, non-irritating diet should be given, with very low fat and sugar content. The general treatment for catarrhal jaundice should be given. Ascites may require surgical relief. Life may be prolonged for some weeks or even for some years. Pulmonary complications, severe diarrhea, convulsions, delirium, coma, or exhaustion, finally terminate in death. In the hypertrophic form, intermission may occur, but the course of the disease is only interrupted, and recovery is, in the presence of the recognized pathology, impossible.

**Abscess** of the liver is rare in early life. Even when infection of the umbilicus occurs, there is rarely abscess of the liver. Other causes are the same as in adults,—trauma, suppurative processes elsewhere in the body, acute infectious diseases, and amebiasis. Worms, especially ascarides, may wander into the bile ducts and thus cause abscesses. Trauma or amebic infection cause solitary abscess; other causes usually result in the simultaneous development of many foci.

The symptoms of multiple abscesses are not very definite. If, in the presence of constitutional conditions associated with infection, tenderness in the liver region or in the neighborhood of the right shoulder is noted, with irregular fever, multiple abscesses of the liver may be suspected; if these symptoms are associated with jaundice, the diagnosis is fairly certain.

The solitary abscess results from trauma or is associated with amebic infection. The liver is enlarged and tender; usually there is dull aching around the right shoulder and through the mid-thoracic area. Fever with chills and sweats; painful respiration; vomiting and diarrhea, with varying jaundice or none, are typical symptoms. The blood shows marked leucocytosis, often to 30,000. Occasionally the X-ray shows the location of the abscess. Aspiration brings pus, and this makes the diagnosis positive. The pus should be examined for amebae and for pyogenic bacteria.

Treatment depends upon the condition present. The solitary abscess can be drained, with good prospect of recovery. A large one of many abscesses can be drained; the presence of others adds gloom to the prognosis. Multiple hepatic abscesses are usually fatal.

**Diseases of the liver with enlargement** include several varying conditions, all rare in childhood.

Tumors include angioma and sarcoma; very rarely any others. There are cases of carcinoma, lipoma, fibroma and cysts. There is a rather slowly enlarging liver with progressive weakness and emaciation. Diagnosis is very difficult, without exploratory operation. Treatment is hopeless.

Hydatid cysts of the liver are very rare in this country.

Congestion of the liver causes enlargement as the result of the great amount of blood present, and of the edema due to the circulatory disturbance.

Amyloid degeneration of the liver is present in tuberculosis and in syphilis; and in suppurative processes which are chronic and severe. The symptoms are vague; there is no jaundice. Marked cachexia, with a secondary anemia and pallor of somewhat waxy appearance, is described. The kidneys are usually involved also, and the waxy casts, edema and ascites due to the renal

disease may help in the diagnosis of the amyloid liver. The treatment is that of the primary infection; the prognosis is very grave in all cases.

Fatty liver is perhaps the most common cause of enlargement of the liver. It is found rather frequently in the acute infectious diseases and in tuberculosis; also in any of the wasting diseases. Fatty infiltration is the more common form. True fatty degeneration occurs from severe and continued toxemia, but is rare. Treatment must be devoted to the original disease. Prognosis is grave.

**Hutinel's Disease.** Cardiotuberculosis cirrhosis of childhood. The disease starts with bronchitis or pleurisy, which is followed by enlargement of the liver, ascities and other symptoms of disturbed circulation. Cardiac symptoms are absent or slight. Tubercular toxins cause the cirrhosis; tubercular pericarditis causes the circulatory symptoms, in part. Operation for liberation of pericardial adhesions is the only known treatment. No evidences of renal disease are present. No cases have been reported in osteopathic practice.

### DISEASES OF THE GALLBLADDER AND BILE DUCTS

Congenital obliteration of the bile ducts has already been discussed, with the Diseases of the Newly Born. Acute cholecystitis and cholangitis may be found rarely, due to infectious processes elsewhere, especially in typhoid fever. Tuberculosis of the gallbladder may be associated with tubercular processes elsewhere. Gallstones may be present at birth, but may be found at any time during life; they are extremely rare in childhood.

Neoplasms of the gallbladder are extremely rare.

Round worms may creep up into the gallbladder and cause inflammation.

### DISEASES OF THE PANCREAS

Functional diseases of the pancreas are not easily recognized. It seems probable that disturbances in the digestion of fats and in celiac disease there may be disorders in the secretory activity of the pancreas, or partial or complete obstruction of its duct. The occurrence of sudden and temporary disturbances of fat digestion, found occasionally present in children after a fall, may be due to disorders of the pancreas or of other digestive organs,—especially the liver and the small intestine.

Disturbance in the lipase occurs first in functional pancreatic disorder. This is shown by the presence of undigested fat in the stools, and the malnutrition due to lack of absorption of fats, as in celiac disease. More serious disturbance results in absence or inadequacy of trypsin, and the proteids are digested only by the gastric juice. Last of all the ferment-disturbances of the pancreas is the amyllopsin, and then neither fats, proteins nor starches are properly utilized.

When this serious disorder is present, the stools contain undigested fats, starches and proteins, with inspissated intestinal secretions and inspissated bile. Nutrition can be maintained for remarkably long periods, however, since proteins can be digested by the gastric juice, while sugars are inverted by the intestinal ferments, and a part of the starch can be changed into sugar by bacterial action. Fats cannot be so handled, however, and must not be fed to such children at all.

Disorders affecting the activities of the islands of Langerhans, and hence resulting in disturbance in sugar metabolism, are known to occur in animals as the result of experimental lesions of the seventh to the tenth thoracic vertebrae; clinic experience supports this view of the bony lesion as an etiologic factor.

**Diagnosis** of a functional pancreatic disorder resulting from a bony lesion rests upon (a) the fact of disturbed fat digestion or disturbed sugar metabolism. Disturbed fat digestion is recognized by the presence of excessive fat in the stools, with normal bile content. Disturbed sugar metabolism is recognized most accurately by the presence of an excess of sugar in the blood, when the child is upon a normal sugar diet. The presence of sugar in the urine is less often found than is the excess of blood sugar. The chemical examination of the blood is, of course, necessary to make the diagnosis of disturbed sugar metabolism in the early stages; only much later does the excess of blood sugar pass into the urine.

(b) The finding of the bony lesions already mentioned, with the localized hypersensitiveness as well as the structural maladjustment and the contracted muscles in the immediate neighborhood of the lesions.

(c) The improvement following adequate corrective work in the lesioned area.

These conditions have been met in many cases of poorly nourished children under osteopathic treatment. Symptoms of celiac disease, and malnutrition without recognizable cause other than the lesions mentioned, with laboratory findings indicative of pancreatic disorder, have been relieved by suitable osteopathic treatment.

**Organic diseases of the pancreas** are rare. Cirrhosis may be associated with chronic pancreatitis, which is probably always due to syphilis, or to severe toxemia from any cause. Tubercular nodules may be found in the pancreas, in generalized tubercular infection.

**Acute pancreatitis** may be present in any of the infectious diseases, but is usually due to mumps. The symptoms are typical; during the course of mumps (or other acute infectious disease) a sudden attack of vomiting and diarrhea, with symptoms of shock, and abdominal pain occurs. The stools contain undigested fat, if whole milk or any fatty food has been given on the day previous to the attack. Abdominal tenderness remains marked. The urine contains much sugar, especially if the child has been receiving carbohydrate food.

**Pancreatic infantilism** or intestinal infantilism, is a peculiar condition in which the pancreas and certain others of the glands of internal secretions fail to function properly. The symptoms are those of pancreatic inefficiency, with infantilism. It is to be distinguished from cretinism, in which the thyroid secretion is lacking.

## PART III. DISEASES OF THE RESPIRATORY TRACT

### CHAPTER XXVI

#### Preliminary Considerations

Certain peculiarities of childhood must be taken into consideration in making a diagnosis of diseases of the respiratory tract, and especially of the diseases of the lungs.

Respiration is very irregular and is much more rapid in children than in adults. The following table is given by Holt for sleeping children :

Birth .....	35 per minute
1 Year .....	27 per minute
2 Years .....	25 per minute
6 Years .....	22 per minute
12 Years .....	20 per minute

The Cheyne-Stokes type of respiration is frequently noted in normal, sleeping babies. During wakefulness, respiration is usually irregular in normal children and especially in young babies. For the first two years of life, irregularities in breathing, when not associated with other symptoms, have no significance. The breath sounds are normally very rough in babies and are somewhat rough in older children.

The thorax is almost cylindrical at birth. During life the antero-posterior diameter becomes relatively less, and the transverse diameter becomes relatively greater. The persistence of the immature roundness of the chest is often associated with respiratory diseases.

Because of the immaturity of the costal structure, the ribs are soft and yielding, hence there is a marked tendency for the chest to sink in when intrathoracic pressure is lowered, or to bulge out when intrathoracic pressure is raised.

The air vesicles are very small in children, and occupy relatively much less space in the chest. Hence, even slight congestion may produce extremely serious respiratory difficulties. The immature and delicate walls of these vesicles permits emphysema to occur readily; the same factors encourage recovery of normal conditions, not only in emphysema, but also in all other pathological states not speedily fatal.

#### Cough

Since the cough occurs under so many varying conditions, some discussion of this symptom may be useful.

Cough is the result of forced, sudden expiration with the glottis almost closed; the glottis is closed during the beginning of the expiration, then slightly opened, allowing the air to escape with almost



explosive force. The position of the vocal cords, the force of expiration, the condition of the respiratory passages, all modify the character of the cough. Some branch of the vagus nerve is usually irritated, and the pulmonary branches are most often concerned. Under certain conditions the quality of the blood and the local condition of the respiratory and neighboring centers in the medulla seem to be concerned in the production of coughing.

Tracheitis, bronchitis and tracheo-bronchitis cause a cough which is frequent and severe, and is, at first, nonproductive. Later mucous or muco-purulent secretions are produced; these are usually swallowed by young children. Vomiting may be caused by the severity of this cough; the muscles of the thorax and the diaphragm are often made very sore.

Catarrhal laryngitis may cause a cough something like that of bronchitis, but more hoarse, and there is hoarseness of the voice also. Spasmodic laryngitis causes a very ringing or brassy cough, sometimes rather like a barking; it is loud and unproductive, unless it is long continued, when a thin mucous secretion may be initiated by the irritation due to the coughing itself. Diphtheritic laryngitis causes a cough rather more croupy and hoarse than that of spasmodic laryngitis, though somewhat resembling it.

Pleurisy without effusion causes a short, often suppressed, painful cough, unproductive and annoying. Pleurisy with effusion causes a short, dry, cough, not painful but troublesome. Pneumonia causes painful cough, often suppressed on account of the pain, not usually very loud; more or less hoarse according to the amount of laryngeal congestion.

Pharyngeal irritation causes a short, hacking, frequent cough, usually worse at night. It is associated with a tickling sensation in the throat, causes no pain, and is usually unproductive, or it may produce a thin mucus. It may be caused by several different conditions; a long uvula, adenoids, enlarged tonsils, are the most common. Accumulations of ear wax, abnormal conditions affecting the middle ear or the Eustachian tubes, are associated with the pharyngeal type of cough, probably through the nervous relations of the ear and the pharynx. This cough may sometimes be paroxysmal.

Pertussis, or any other very severe tracheobronchitis, or enlarged bronchial glands, or the pressure due to spinal caries or to deformities affecting the laryngeal nerves, may cause a peculiar paroxysmal cough, often repeated until the following inspiration is forced and associated with contracted glottis—the “whoop” is thus produced.

A short cough may precede vomiting; or it may occur without vomiting as a result of gastric disorders, usually associated with nervous irritability. The “stomach cough” is often mentioned but is rarely present, though no doubt it does occur in nervous

children occasionally. Probably related to this is a short, barking, frequent, unproductive cough which occurs as the result of rectal tension; it is present in constipated children, and ceases at once after an enema, or after the anal sphincter has been dilated. It is usually associated also with muscular tension, with or without bony lesions, in the spinal lumbar region.

Cardiac cough is the result of pulmonary congestion; it is dry and painless. It may be due to pericarditis or endocarditis, either acute or chronic, or to valvular lesions.

Nervous coughs are frequent, rarely paroxysmal, noisy and loud, dry, unproductive, varying in hoarseness. The irritation may cause a thin non-purulent secretion; this is usually swallowed, even in larger children. It is less annoying at night, and is made worse by fatigue, hunger, or emotional stresses.

Coughs are to be treated according to their etiology. For relief, steady pressure along the spinal column where the muscles are found most contracted may be efficient. Raising the ribs and compelling slow, easy breathing may be helpful. Breathing of steam, either alone or with various pleasant smelling substances, often gives immediate relief. The various spices, volatile oils, and so on, often associated with the steam, make the inhalations more pleasant and thus promote deeper breathing. For the cure of the cough, the removal of the causative factor is necessary.

### Epistaxis

Nosebleeding is a common symptom, and it may be due to any one or more of many causes. The blood may originate in adenoids, or, more usually, from a ruptured blood vessel upon the septum, rather toward the anterior aspect, or located elsewhere. The nasal blood vessels may be unusually abundant and may be larger than usual, or may be varicose. These peculiar structures may be inherited. An ulcer may be the source of the bleeding, and this is usually placed upon the septum.

Coryza, coughing or picking at the nose may precipitate an attack. Severe anemias, especially those with hemorrhagic characteristics, usually have nose bleed as one of the symptoms. At puberty nosebleed is common, especially in girls.

Nosebleed is especially serious in purpura hemorrhagica, scurvy, leukemia, and in the hemorrhagic forms of certain infectious diseases.

Attacks may be precipitated by emotional storms, excitement, over-eating, exhaustion, or any factor which raises the blood pressure.

Some pain or a sense of fullness above the nose may precede the attack, or a feeling of dizziness may be noted. The blood usually drops, fairly rapidly, and since a very small amount of blood causes

a very large stain, the amount of blood actually lost is usually over-estimated.

When the bleeding occurs at night, the blood may be swallowed, and the condition recognized by the presence of occult blood in the stools, if at all.

**The treatment** is usually successful, except in those cases associated with serious constitutional disease. To stop a hemorrhage in progress, several things may be done, and the mother should be advised as to these simple measures. Firm pressure on the jaw, just below the nostrils, may stop the hemorrhage. Ice applied at the root of the nose, or at the back of the neck is useful, or small bits of ice may be placed within the nostril. Cold compresses may be used in the same way, and these are less apt to cause chilling; they are occasionally more successful than the ice.

Compressing the alae with the fingers may give relief, though it may act only by forcing the blood backward into the pharynx.

The child should sit erect, with the hands behind the head; he should not have any tight clothing, especially around the neck. He should not exert himself, and should not blow the nose. After the bleeding has ceased, he should not be permitted to blow the nose for as long a time as possible, in order to prevent loosening the clots.

A small tampon of gauze may be pressed firmly against the bleeding surface; this is not an easy thing to arrange, and it is usually successful at once. The gauze may be left in place for some hours.

In the intervals, the treatment must be devoted to the correction of predisposing conditions. Lesions of the cervical and upper thoracic region should be corrected, and lesions interfering with nutrition should receive attention. The general health should be brought as nearly normal as possible.

Epistaxis may be fatal in severe diseases, as in typhoid fever, leukemia, hemophilia, or the hemorrhagic infectious diseases. The ordinary type of nosebleed is not apt to cause any serious effects.

## CHAPTER XXVII

### STENOSIS OF THE RESPIRATORY PASSAGES

Any narrowing of the respiratory passages may cause serious dyspnea. The etiological factors are numerous. The larynx may be more or less completely occluded from within by foreign bodies; edema of the glottis, subglottic laryngitis, or pseudo-membranous laryngitis, however caused; and by laryngeal stridor and spasmodic laryngitis; and as a result of tubercular, syphilitic or pyogenic ulcers. The larynx may be occluded by the pressure of retropharyngeal or retroesophageal abscess; of an enlarged thyroid; of greatly enlarged lymph nodes, or of tumors.

The trachea and the larger bronchi may be occluded, more or less completely, by foreign bodies, pseudomembranous inflammations or the results of ulcerations, however produced.

The trachea itself may be stenosed or occluded as the result of scar tissue following tracheotomy.

Enlarged thyroid, enlarged bronchial lymph nodes, tumors, and, especially, an enlarged thymus, may exert such pressure upon the trachea or bronchi as to cause severe symptoms and, occasionally, death from suffocation.

The symptoms are those of inspiratory dyspnea, with marked activity of all accessory muscles of respiration, both inspiratory and expiratory. Cyanosis, weak, rapid, irregular pulse result from the dyspnea and inefficient aeration of the blood. The breath sounds are very weak or may be absent, over the area affected by bronchial stenosis. If the occlusion is complete, the affected lung area becomes collapsed, and, if large enough, a dull note is elicited by percussion.

If the trachea is affected, the breathing is much more noisy than when a bronchus is affected, and the two lungs give identical findings on physical examination.

The treatment must be devoted to the removal of the impediment, if this is possible.

### Malformations

Deviations of the septum may be due to malformation, or to trauma. Depression of the bridge may be due to trauma, or to the destruction of tissue in syphilis, or to deformity, or the condition may be hereditary. Nose breathing may cause deviations.

Stenosis of the nasal passages may be congenital. The first indication of the condition is noted in the baby's inability to suck. The examination of the nasal passage by a sound shows the obstruction, and this may be merely a membrane, easily removed, or a bony malformation.



The broad nose of cretinism is easily recognized. The narrow fossae, broad bridge, and the small, pinched nostrils of the child with adenoids are easily recognized.

Malformations of the lower respiratory tract have already been mentioned.

### **Tumors of the Respiratory Tract**

Nasal Polyps are unusual in childhood, but may occur. Lesions of the upper thoracic spine, and especially lesions of the mid-cervical region, cause chronic congestion of the nasal membranes, with some edema and some weakening of the connective tissues. These conditions predispose to a bulging of the membranes, and the initiation of serous and mucous polyps. These undergo various later changes, and may become fibrous or myxomatous in character.

They are encouraged also by hypertrophic rhinitis or any other condition which interferes with the normal drainage of the secretion, or the normal circulation of the blood and the lymph.

The symptoms are those of obstruction to respiration; headache, partial deafness; sneezing, coughing, and mouth breathing are the usual causes of complaint.

The treatment includes the surgical removal of the polyps, and the correction of such predisposing conditions as may be found on examination.

Such tumors as fibroma, glioma, papilloma, chondroma, and malignant tumors, such as sarcoma or epithelioma, may, very rarely, be found in the nose during childhood. Their treatment is surgical.

Tumors of the lower respiratory tract are even more rare.

Their diagnosis is then extremely difficult, if it is possible at all. No treatment is very satisfactory, though surgical removal may give good results.

## **FOREIGN BODIES IN THE RESPIRATORY TRACT**

### **The Nose**

Babies, and even older children, have a queer habit of putting small objects into the nose. Beads, peas, beans, cherry stones, small pebbles, buttons, and other similar objects are most often inserted in this way.

Efforts at removal may push the object further into the cavity, or it may simply be allowed to remain, unnoticed, for days. The child may not say anything about the matter, and only the symptoms, later, lead to a suspicion of the presence of some foreign object.

The irritation caused by its presence leads to increased nasal discharge, and this becomes purulent and may become very foul. Ulceration may occur, and bleeding may be a pronounced symptom.

Removal must be secured; sometimes by blowing the nose with the normal nostril closed is enough to eject the object; or it may be necessary to remove it with forceps, after bathing the membrane with cocaine.

After the removal, the treatment is that of chronic rhinitis.

### The Larynx

Objects in the mouth may be drawn into the larynx, especially when the child inspires deeply with food in the mouth, as in sneezing, coughing, laughing, crying, or in fright. An excised tonsil, or pus from an abscess may, rarely, enter the larynx. Ascarides have been known to reach the larynx and to cause strangling.

The symptoms are typical; a sharp, laryngeal cough, and evidences of suffocation. The cough usually dislodges the object, and no harm results. If the object is not dislodged, it may cause death from suffocation, or it may become fixed; in the latter case, the symptoms of very severe acute laryngitis soon follow, with pain, cough, bloody discharge and occasional attacks of suffocation. Ulceration, and perhaps erosion of blood vessels, may follow later.

Diagnosis is usually easy. The X-ray may show the exact location of the object. The use of the laryngoscope may cause fatal suffocative attacks, especially in young children.

Treatment must be immediate. A child may be hung from his feet, and made to cough; this may dislodge the object. If suffocation seems imminent, tracheotomy must be done quickly; even if aseptic instruments are not at hand, the danger of suffocation is greater than the danger of infection.

If the condition of the child is not immediately dangerous, and the object is not dislodged, its surgical removal, under very carefully guarded conditions, is necessary. Oxygen should be at hand, in case of a serious suffocative attack. The nature of the operation depends upon the exact location of the object, and the choice of the surgeon.

### Trachea and Bronchi

Foreign bodies entering the larynx may be drawn downward into the trachea and the bronchi. The right bronchus is far more often affected. If the object is large enough to occlude the trachea, death results quickly. If it is smaller, it may remain a long time, partially imbedded in the swollen membrane. Dyspnea and coughing are the first symptoms. If the body is movable, suffocative attacks may occur; these are not present if the body is fixed. Abundant mucous sputum is formed, and later, if ulceration occurs, the sputum becomes purulent, variably blood stained, and it may be very foul. Scar tissue may heal over the ulcer, perhaps imbedding the object, and this results in a gradually increasing stenosis.

If the object enters a bronchus, and occludes it, the affected lung becomes collapsed. Cyanosis, severe dyspnea and coughing, and pain in the chest are the most marked symptoms. Breathsounds are not heard over the affected lung; resonance may be normal or increased; and later be diminished; emphysema and abscess may result, and these cause characteristic physical findings. If the obstruction is partial, a whistling sound may be heard, and this be transmitted to all the lung area.

The prognosis is grave. After the immediate danger of suffocation is passed, the danger of later fatal suffocative attacks must be remembered. Later, ulceration is very apt to occur, and this may result fatally; bronchopneumonia and pulmonary abscess are to be expected. A general septic state may result, and this be fatal.

Rarely, a foreign object may remain in a bronchus without exciting very serious symptoms, and the object be ultimately coughed up and recovery occur.

If the history of the entrance of a foreign object is secured, the diagnosis is easy. If no such history can be secured, it may be very difficult to determine the real condition of the child. The sudden onset, with violent cough and severe dyspnea, may suggest the condition. The X-ray plate may give very exact information.

The treatment is surgical. Preparations should be made for immediate tracheotomy, in case of suffocation, and the bronchoscope may facilitate the removal of the object.

### **The Lungs**

Fine particles, such as dust, are the only foreign objects which can reach the alveoli. These are usually taken up by the phagocytic cells, and carried to the bronchial lymph nodes. Much of such dust remains in the alveolar epithelium, and the condition called "pneumokoniosis" results. Unless the amount of dust is unusually great, or the particles are sharp and irritating, no harm results. If too much dust is inhaled, or if the particles are sharp, as in stone dust, (chalicosis) tubercular or other infection is encouraged.

### **The Pleura**

Foreign objects cannot reach the pleura, except as the result of incorrect surgical operations.

## CHAPTER XXVIII

### DISEASES OF THE NOSE AND PHARYNX

Since diseases of these tissues are so nearly related, it seems more practical to discuss them together, rather than to separate the laryngeal, or technically respiratory, from the pharyngeal, or technically digestive, part of the tract.

Constitutional diseases and infectious diseases both affect the nasopharyngeal region to some extent; for the discussion of these conditions, see the chapters upon rheumatism, tuberculosis, syphilis, the acute infections, and other diseases mentioned in the index under rhinitis, and pharyngitis.

The innervation of these tissues, and of the blood vessels which supply them, is rather complicated. For this reason, lesions which may affect the circulation and the nutrition of the nose and the throat are rather widespread. Lesions of the occiput, of the atlas, axis, third cervical, of the upper thoracic spinal column, of the upper ribs and the clavicles, of the hyoid and the mandible, may affect the mucous membranes and predispose to infections, or cause chronic congestion of the tissues of the nose and throat.

Abnormal structural conditions of the nasal bones and the cartilages may also be responsible for similar conditions.

The great importance of maintaining normal conditions of the nose and throat is easily recognized. The oxygenation of the blood depends upon a free passage through the nose and pharynx and the larynx, trachea and lungs; and upon the existence of the normal structures which cleanse and warm and moisten the air before it reaches the delicate lung tissues. The nutrition of the body depends upon the food, and this can only be taken adequately when the appetite is good and when the food is properly chewed and swallowed,—and these things are impossible when there are obstructions to the respiratory passages, or when there are infectious areas draining into the throat and mixing with the food. The normal condition of the ears and efficiency in hearing depend upon the freedom of the Eustachian tubes. The anterior fossa of the skull, in which rest the lobes of the brain concerned in the higher mental processes, are drained into the nasal lymphatics; thus mental development depends to some extent upon the permeability of these lymph channels. The tears from the eyes drain into the nasal chambers by way of the lachrymal duct, and this may be occluded by inflammatory processes affecting the nasal membranes. All of these considerations are the more superficial factors concerning the great importance of the health of the nasopharyngeal region as a factor in maintaining the health of the rest of the body.



This is pre-eminently true in children; the lymphoid tissues are, in them especially, apt to become hypertrophied; their brains are undergoing very rapid development; they are establishing habits which persist throughout life, and their bodies are easily affected, during their rapid growth, by whatever affects the general nutrition, the oxygenation, and the nervous control.

**Acute pharyngitis** (simple angina) is a common disease of childhood. The primary form may recur frequently. It is due to several different factors: lowered resistance of the child is, perhaps, the most important. Adenoids and diseased tonsils may be responsible for maintaining an infectious focus, by means of which supplies of pathogenic bacteria are kept always in readiness for rapid growth at any time when the immunity of the child is lowered. Over-exposure to cold, and especially to damp chilliness, are factors; so also is the habit of keeping children in rooms which are overheated and under-ventilated. Digestive disturbances, especially those due to the overeating of starches and sweets, are also etiological factors.

The acute attack is probably always due to infection by any one or more of those organisms having a more or less constant habitat in the mouth, around ill-kept teeth, in the crypts of abnormal tonsils, or among the folds of adenoid masses.

Pharyngitis is usually accompanied by rhinitis or stomatitis or both; laryngitis is probably always present in all but the mildest and most definitely localized cases. The throat feels dry at first, with pain on swallowing; frequent, annoying cough soon appears; this is not associated with any pain in the chest, but often the cough hurts the throat. Fever and chilliness are early symptoms; the neck is stiff and the lymphatic nodes of the cervical and upper thoracic region are enlarged. In very young children and infants the symptoms may become more severe, and convulsions may occur, with vomiting and high fever.

Examination of the pharynx shows the throat reddened and swollen; dry in the early stages, but covered later with tenacious muco-purulent secretions. The tongue is coated; the odor of the breath feverish and unpleasant.

**Chronic pharyngitis** is less common in children than in adults. Its most frequent cause is mouth-breathing, though it may be due to same conditions as those which cause acute pharyngitis, long active; or it may follow from repeated attacks of the acute form. The chronic form usually shows enlarged follicles and a duller tint of the membrane; the throat is less painful, and fever is less common. The chronic inflammatory condition of the pharynx may cause deafness, through the effect produced upon the pharyngeal end of the Eustachian tubes.

**Uvulitis** is almost invariably present in pharyngitis, either acute or chronic. The uvula may become so swollen as to cause constant coughing, and it may interfere with swallowing.

**Elongated uvula** often results from chronic uvulitis, but it may be a congenital condition. If congenital, the irritation due to its length may so irritate the throat as to facilitate the development of pharyngitis, in which case the associated uvulitis further increases the length of uvula.

**Treatment** of simple or primary acute pharyngitis is usually speedily efficient. The child should be put to bed at the first appearance of the disease, after having a warm bath and being dressed in loose night-clothing. If he is feeling well and objects to bed, some unusual toy may be given him. It is best to insist upon bed and night-clothes, however, even if he does refuse. He must be kept from other children until the diagnosis is certain.

The mother should know the importance of early osteopathic treatment in every acute illness in children, and should see that this is given as soon as possible.

Thorough relaxation of the cervical and upper thoracic muscles should be given, with raising the ribs, giving arm movements, raising the clavicle and seeing that all the tissues of the neck and the upper thoracic region are flexible and that the lymphatic drainage is normal. The abdomen should be palpated, and if any evidence of fecal retention can be found, suitable measures employed for the relief of this condition,—enema, massage, and the usual measures advised under the heading “Constipation”, in refractory cases. This is most important, for constipation is often associated with a tendency to repeated attacks of acute pharyngitis.

Food should be refused; if the child seems hungry he may be given fruit juices, or vegetable soup, made without meat or fats. If he has fever and no appetite, it may be difficult to get him to drink enough water. Ice may be given, or ices made of fruit juices without milk. Gargles of normal salt solution, as hot as is comfortable, may give relief in older children. This may alternate with the ice placed far back in the mouth. Cold compresses may give relief; the mother or nurse should be taught how to apply these, avoiding wetting the clothing.

The further treatment of the acute form, the prophylaxis of both forms, and the treatment of the chronic type, are practically identical.

Osteopathic treatments must include occasional examinations, with the correction of such lesions as may be found anywhere. While it is, perhaps, most important that the bones, ligaments and muscles of the neck and the shoulder girdle be kept normally related, yet there is not any abnormality which may not be a factor in perpetuating the disease, either directly or indirectly.

The factors mentioned as of etiological importance must be considered. Cleanliness of the mouth, nose and teeth is essential to complete and permanent recovery. Sleeping and living rooms, and school rooms, must be well ventilated, not too hot, and yet never chilly. Sunshine is important if it is possible to secure it. Change of climate, especially from a chilly damp to a dry climate; a dry cold may be even more beneficial than a dry warm climate; this cannot be definitely stated, since children vary in their reaction to climatic changes.

Sometimes it is only necessary to put dry shoes and stockings on cold feet; sometimes complete renovation of the habits of living are necessary for recovery.

Daily bathing should become a habit. For delicate children, the dry bath may be given for the first few days; then the towel may be dampened, the next week a cool, then a cold sponge bath may be given, thus the skin is able to accommodate itself to the changes. Children of wealth may suffer from vitiating surroundings as much as the children of poverty suffer from deprivation.

**The diet** of the child must receive attention, as soon as the fever and the swelling have diminished and the appetite returns. Starches and sweets must be kept down to a low minimum; raw fruit and vegetables must be given plentifully. If he craves sweets, dates, raisins, raw prunes, figs, may be given him freely,—if he eats the other foods he needs. The juice of raw carrots, spinach, and other vegetables may be diluted and given as “medicine” if necessary. Butter and cream and milk may be especially needed if the diet has been deficient in these things. Especially must the child abstain from the munching of candy, crackers or cookies between meals; perhaps there is no one thing more responsible for chronic pharyngitis than this one of diet, and especially the over-eating of carbohydrates. The lack of vitamins is important, especially in poor sections of crowded cities. When this is a factor, probably the most useful addition to the diet is an alternation of tomatoes, cabbage and carrots, of which at least one must be eaten raw each day. Milk should be an important part of the diet in this, as in all other conditions of childhood.

## GLANDULAR FEVER

After an attack of rhino-pharyngitis, when this is due to streptococcus or when this organism is present and active, associated with other pathogenic organisms, glandular fever may supervene. The “short-chain” variety is most apt to cause the disorder. Any of the pyogenic infectious agents may be responsible, but less often than the streptococcus.

**Symptoms.** The disease begins with acute, but not always severe, symptoms of relapse or exacerbation of the rhinopharyngitis. Rigor,

which may occur in young babies, is marked, and this is followed by sharp and sudden fever, often to 105°F., and sometimes to 107°F. The fever diminishes within a few hours, and within a day or a few days the enlargement of one or more of the cervical lymph nodes is noted,—they rarely exceed the size of a hazelnut. They are somewhat painful on palpation, but do not give any apparent pain when untouched. They subside within a few days or so; almost at once the symptoms are repeated.

The rigors and fever, with subsequent enlargement of the nodes, may occur at any time, with no recognizable exciting cause, and with no apparent regularity. At each attack, a new group of cervical lymph nodes becomes enlarged. The series of attacks may last for six weeks or more.

Anemia and emaciation are usual after effects. The nodes may suppurate and break, discharging upon the surface of the neck.

Faulty diagnosis may lead to the error of supposing the nodes to be tubercular, and they may be excised; this is a serious error, and leads to further infection which may be fatal.

**Treatment** is indicated by the nature of the disease. Lesions of the mid-thoracic and the lower thoracic vertebrae, and the lower ribs are concerned in lowering immunity to infections; these lesions must be sought for, and corrected as speedily as possible. Increased mobility of the lower thoracic spinal column should be secured, mostly by flexion and extension and rotation of this part of the spinal column. Treatment of the cervical and upper thoracic region, and of the shoulder girdle, must be very carefully given. No pressure must be given the enlarged nodes.

For the resulting anemia and malnutrition, the best possible hygiene and diet, with occasional osteopathic examinations and the correction of such faulty conditions as may be found, is usually sufficient.



## CHAPTER XXIX

### DISEASES OF THE NOSE AND THROAT AND THEIR OSTEOPATHIC TREATMENT

By William Otis Galbreath, D. O.

#### GENERAL DISCUSSION

Before undertaking the discussion of our subject it is important to state that always, even though not explicitly so stated, the author implies that careful, thorough, specific manipulative, structural adjustive measures are a part of the procedure.

The specialist in dealing with the topical applications and surgery which are only a part of the osteopathic procedure may omit to mention the manipulative, structural adjustive treatment, though he may not overlook or minimize its importance.

Parents should be taught to use certain simple manipulations on sick children between the visits of the osteopathic physician.

Parents are often unduly alarmed over a comparatively trivial ailment of a child. The physician's visits seem very infrequent, especially if no advice is given as to the intervals between them. Any mother of average intelligence can be instructed how to use certain manipulations that give real relief to distressing symptoms.

Since a knowledge of the predisposing and primary causes is very important in the treatment of any diseased condition, it may not be untimely to mention some of these disturbing factors before considering the several diseases of the nose and throat.

We readily understand when we consider the anatomy and the physiology of the nasal chambers that the conformation of this portion of the breathroad is naturally conducive to certain diseases. These passages are so arranged that the inspiratory current of air passes upward from the vestibule of the nose to the middle and superior meatuses. The current is then deflected downward and backward by the middle turbinal bodies and the roof of the nose through the posterior nares, into the epipharynx. Its passage through the narrow and tortuous channel of all these chambers is designed to filter, warm and humidify the inspired air before it reaches the larynx, and while this preparation is very important for the protection of the lower portion of the respiratory apparatus, the structures which compose this route perform the function to their own detriment. This is especially true when the inspired current becomes laden with irritating materials such as dust and smoke or is drawn in under conditions of sudden atmospheric changes.

In order to offset these detrimental conditions the membranes, of course, acquire a certain amount of immunity against the invasion of irritants. For example, the new-born child sneezes during the first few days of life because of the beginning of the function of respiration and the consequent inspiration of dust in the air; but the mucous membranes gradually adjust themselves to their new environment and the sneezing ceases.

Diseases of the nose and throat are almost always caused or accompanied by bacterial invasion, but usually the condition necessary for the growth of bacteria is a lowered vitality of the cells of the tissues. The cause of this lowered state of resistance is invariably a structural lesion, located either in the spinal column or in the structures which form the nasal chambers. It may safely be said that indications for structural adjustment in the nasal chambers are second in frequency only to those in the spine. Owing to the nature and location of these nasal lesions it is usually necessary to employ instruments to remove them.

Today every student in osteopathy is convinced of the great importance of dealing with all spinal lesions with understanding and skill. But to treat nose and throat diseases successfully he must be able to diagnose any structural derangement within the nasal chambers. And since function is changed by alteration in structure, a disturbance of any of the five nasal functions (i. e. olfaction, respiration, ventilation, phonation, drainage) should make the doctor suspect some abnormality of structure.

Fortunately there are some very definite subjective signs which lead us to suspect lesions in this region more readily than in most parts of the body.

1. If, for instance, the patient wakes up in the morning with a dull frontal headache of the kind which wears off gradually after he has been up and around for an hour or so, we may expect to find some obstruction high in the nasal chambers. This ache is not easily confused with that caused by eye strain; for should it be of ocular origin it would subside at night and recur while using the eyes. In this connection it may be recalled that if there is any stenosis or tendency thereto of the fronto-nasal duct, the frontal sinus does not drain well with the patient recumbent—and hence there is congestion on first assuming the upright position. The amount and time of relief depend on the degree of drainage through the fronto-nasal duct.

2. If a constant fullness and stuffiness is felt between the eyes across the bridge of the nose, it may be taken as a well-marked symptom of high structural deviation. Nearly always such deviation consists in apposition of the septum and middle turbinate through septal deflection or middle turbinal hypertrophy.

3. Constant inability to breath freely through either of the nostrils (always on the same side) is conclusive evidence of chronic hypertrophy of the inferior turbinate or structural abnormality of the septum or the maxillary ridge.

Other symptoms, less concrete insofar as they may originate from other causes, are intermittent and alternating stenosis; a constant catarrhal discharge either through the anterior nares or through the posterior nares into the throat; neuralgia; nosebleed; spasmodic cough or sneezing; perversion of the sense of smell; eye-affections; asthma and hay fever—all of which simply mean perversion of one or more of the five functions.

The operations which are commonly performed within the nasal chambers to correct these lesions are:—the submucous resection of the nasal septum; turbinectomy; the removal of polypi, the excision of spurs and ridges from the septum; and the various operations of the nasal accessory sinuses such as enlarging their openings into the nasal chambers and the curettement of their lining membranes, and local irrigation of the several sinuses.

Local anesthesia is usually employed in these operations as the astringent effect of the cocaine and adrenalin is needed. When it is advisable to use a general anesthetic it is best to pack the nose with gauze saturated with a solution of adrenalin chloride during the second stage of the ether. This procedure will in most cases keep the mucous membrane ischemic until the operation is finished.

Operations of this nature are rarely performed on children before their fifth or sixth year, though in some cases earlier operations are absolutely necessary. Today this type of nasal adjustment is being very successfully performed during the later years of childhood, hence its inclusion in the present treatment of diseases of the nose and throat in children.

### ACUTE RHINITIS

Acute rhinitis, a very common disease, is apt to terminate detrimentally if neglected. The micrococcus catarrhalis is usually present as a causal factor in the nasal discharge, but this alone is not sufficient to cause rhinitis, unless accompanied by one or more predisposing causes. Such predisposition is usually found in the form of spinal or nasal lesions aggravated of course by such accessory causes as sudden atmospheric change, hereditary weakness, and adenoid vegetations. If unaccompanied by predisposing factors, the bacteria which are constantly found associated with acute rhinitis may harmlessly remain in the nasal chambers.

Another variety, specific rhinitis, may be caused by the bacterial irritants which are associated with children's diseases, such as measles, diphtheria, whooping-cough and scarlatina. It is well to bear this fact in mind while examining acute rhinitis in children, especially if there is a high temperature or other confusing symptom.

At the beginning of acute rhinitis the patient may sneeze several times and complain of chilliness, lacrimation, dryness of the mouth and throat, and an interference with the smell and taste. On inspection the mucous membrane is seen to be dry, engorged and shiny; and then as the infiltration becomes more extreme, there is a discharge of clear mucous, which becomes mixed with the various bacteria and the debris caused by exfoliation of the epithelium and forms a thick mucopurulent discharge.

As a preventive measure, children should be bathed every morning, first with soap and water, at about the body temperature, and then sponged with moderately cold water. Most children over two years react splendidly to this treatment, unless it is contraindicated by some constitutional disease. The diet must be regulated to the individual case. Most children are over-fed, others are poorly nourished. The quantity of clothing should be regulated according to the patient's ability to resist cold. We must also remember that as some children perspire much more freely than others, the texture of the underclothing is important. Wool is a good heat retainer, but a poor absorbent, while cotton is neither. Linen is a splendid absorbent and a fair heat retainer. Therefore, a mixture of wool and linen makes an ideal undergarment for many children. Flannel belly-bands over the abdomens of young infants are often useful if not absolutely essential. Osteopathic structural adjustive treatment and proper feeding are the means best suited to normalize the natural resistance of the patient, for they go hand in hand.

Most patients do not consider acute rhinitis important enough to submit to any systemic or local treatment, except probably that which may be given by themselves or one of the family.

In either home or office treatment, cleansing of the mucous membrane is of primary importance. This is best done by nasal irrigation. *Technic*—A sterile fountain syringe should be filled with normal saline solution at a temperature of about 112 to 118 F. The patient then bends his head well down over a receptacle, and after letting the solution run until it is warm, places either the end of the rubber tubing or a suitable nozzle which has been connected with the tubing into one nostril. This causes a smooth stream of the solution to run into the nasal chambers and pass around the septum through the epipharynx and out the other nostril. The fluid should be made to run very slowly until the mucous membrane has become warmed sufficiently to stand the extreme heat. It is best to follow this treatment by a gentle spray of oil such as liquid albolene. It is best, of course, to use an atomizer for cleaning the nasal chambers of small children.

In making local application to the mucous membrane it is best to use topical applications which promote inflammatory reaction such as silver nitrate, of a strength indicated by the acuteness of



the inflammation. Neither cocaine nor adrenalin chloride should ever be used as a therapeutic measure, except in certain cases to shrink a small area of the mucous membrane in order to free the drainage of one or more of the nasal accessory sinuses.

The general management consists mainly in thorough osteopathic treatment correcting all lesions, muscular or bony, which may be found on examination.

It is helpful to get the body at an even temperature. This is best done by having the patient lie in a bath a little above the body temperature, as nearly submerged as possible for fifteen or twenty minutes. He should then be thoroughly dried with a rough towel and put to bed.

### CHRONIC RHINITIS

When acute rhinitis merges into the chronic form there is usually present a profuse and persistent muco-purulent discharge which is often associated with occlusion of one or both nostrils. The obstruction may be stationary or it may alternate from one side to the other. During sleep the most dependent side is apt to be occluded. At this time organic changes are apt to begin in the tissues which may terminate in the hypertrophic or atrophic type of chronic rhinitis.

The etiology differs but slightly from that of acute rhinitis. We may add that intranasal obstructions and spinal lesions are even greater factors here, for if it were not for these deviations many cases of acute rhinitis would recover.

The general treatment consists of correcting, when necessary, the child's diet, investigating the clothing worn, advising proper bathing and exercise, and the removal of spinal and nasal obstructions. Manifestly then our efforts are intended to enable the patient to escape unnecessary exposure and at the same time to improve his general state of health and resistance.

Nasal irrigation, always followed by a bland oil spray as before described, is probably the most helpful agent in the local treatment. This method of cleansing the nasal mucous membranes has been severely criticised in medical literature as being liable to infect the middle ear. It requires only a little precaution to carry out the procedure in perfect safety. The author has used this method of irrigation in several hundred cases covering a period of twelve or fourteen years without detrimental results in a single case.

Local applications are used as in the treatment of acute rhinitis except that they should be very much weaker, as the inflammation is usually in a subacute state.

To relieve the congestion causing turgescence in older children a pledget of cotton saturated with a fifteen per cent solution of argyrol should be placed in the nostrils for about fifteen minutes.

The upper end of the pack is extended well above the middle turbinal body. This treatment is often indicated daily until the symptoms subside.

### PHARYNGITIS

Pharyngitis in children may be primary but is usually caused by inflammation spreading from the tonsils, adenoids, or one or more of the other organs which help to form the tonsillar ring. The inflammation, whether primary or secondary, may be due to bacterial invasion or to cold and exposure, usually both. If the patient is subject to pharyngitis there are usually structural deviations in the cervical or upper dorsal region of the spine, which interfere with the vascular tone.

The symptoms vary somewhat in accordance with the nature and location of the associated inflammations. The onset is always sudden, accompanied by severe pain in the throat. Dryness, swelling dysphagia, and partial loss of voice follow in turn.

If the disease shows signs of being of a serious nature a bacteriological examination of the secretions should be made to determine the nature of the infecting or associated organisms.

The throat should be frequently cleansed by using a cotton-wound applicator saturated with Dobell's or other cleansing solution. Local applications of a solution of iodine or nitrate of silver of a strength indicated by the severity of the inflammation may be used during the acute stage.

Thorough relaxing, manipulative treatment should be given the upper dorsal and cervical region of the spine to normalize the nerve impulses and free the venous drainage of the affected parts.

### SPASMODIC LARYNGITIS (Spasmodic Croup)

During the twenty-four hours preceding the spasmodic attacks of this acute laryngitis, the child usually has a slight rise in temperature and an increased pulse rate combined with general restlessness and irritability. The child retires at his usual bed time and sleeps very soundly until some time between midnight and early morning. Then he suddenly gives a cry of terror and begins struggling for breath. Inhalation is accompanied by the characteristic croupy wheeze, and frequently expiration by a brassy cough. The lips are cyanosed and the eyes are wide open and staring. The strangulation and suffocation are very severe; although death rarely occurs, as the accumulation of carbon dioxide in the lungs causes a spontaneous relaxation. The suffering is intense. In fact, those of us who experienced this ordeal when at the age that we can recall, are not likely ever to forget the terrible pain, agony and fear of impending death that accompanied it. Therefore we should not only be able to give the quickest possible relief, but also we should teach

the mother or some other member of the family how to alleviate the suffering of the little patient during our absence.

The first thing is to relieve the spasm; this is best accompanied by thoroughly relaxing the upper portion of the thorax and the dorsal and cervical region of the spine by manipulative treatment. The patient may be placed in the dorsal position or, should the spasms be so continuous and severe as to prevent the patient lying down, the half-sitting posture may be employed by propping the child up with pillows. Place one hand underneath the patient's spine and the other upon the chest over the bronchial tubes and larynx, gently but deeply relax all the involved tissues. In severe cases in order to maintain this relaxation it is well to apply one of the commonly used plasters to the thorax, front and back, immediately following the treatment.

As a home remedy, in case the child should be subject to recurrent attacks, the person in charge should be instructed to apply dry heat to the front and back of the upper portion of the chest and also to the feet when an attack seems to be impending.

A towel should be wrung out of cold water and wrapped around the neck. The relief this brings is usually instantaneous. If not, the patient should be placed in a hot bath in a warm room until relaxation takes place. In some cases, when life seems endangered, a few minims of chloroform dropped upon a handkerchief and inhaled by the patient gives instant temporary relief. Prompt relief follows the inhalation of steam arising from water in which a few drops of menthol have been placed.

The fact should be borne in mind that gastro-intestinal irritation sometimes causes or helps provoke an attack of croup and in these cases emetics and enemata prove valuable.

After the acute attack has been relieved a search should be made for predisposing causes, such as adenoids or inflammation of the faucial or lingual tonsils, or structural nasal and spinal lesions. Also the physician should look into the child's diet, clothing, bathing and general habits and manner of living. Frequently the ignorance, indifference, or actual opposition of parents will have to be contended with, but they should be resolutely brought to terms. There will probably be found a number of conditions which need correction in order to adapt the environment to the child's age, temperament, strength and individual characteristics.

### ADENOIDS

The enlargement of the lymphoid tissue, which always exists during childhood upon the upper posterior wall of the naso-pharynx, commonly referred to as adenoid vegetations or hypertrophy of the pharyngeal tonsil, usually occurs between the third year and puberty. The condition may be found during the first year of infancy and

even at birth. At puberty this obstructing mass normally decreases in size, and at this period the bones of the face develop rapidly, so that the lumen of the breath road is greatly increased. Although in exceptional cases adenoids remain sufficiently large after puberty to cause obstructions, ordinarily the mental and physical injury which they cause takes place during early childhood. They cause an oxygen starvation of every organ and tissue in the body.

As a rule when the child is brought to the physician because of obstruction due to the presence of adenoids the symptoms are marked as to be easily recognizable.

They are usually mouth-breathers, with short, thick upper lips and dull, listless expression. These children fared badly in the old schooldays, and were objects of ridicule among the more fortunate pupils. They simply could not concentrate upon the tasks they were given to do. The schoolmaster, believing them to be obstinate, flogged them and made them stand in the corner to study their lessons. He never dreamed that there was a physical obstacle which interfered with their mental development.

In many states compulsory physical examination of school children is now a routine procedure and when thoroughly done by competent physicians it is to be highly commended.

The physical and mental improvement which follows an adenoid operation is often very pronounced, and the results are more convincing than those obtained in most forms of surgery practiced at the present time. The removal of this hindrance to normal breathing is in perfect harmony with osteopathic practice. The mental transformation of a child following adenoidectomy is frequently startling, the dull, wooden face becoming bright and full of expression, and the mind alert and active.

Hypertrophy of the adenoid tissue in the nasopharynx should be removed, even in infants, when it causes mouth-breathing, incipient deafness, mental dullness and anatomical changes in the throat and nose—or succinctly, whenever defective oxygenation is noted. This should include a thorough cleansing of all adenoid tissues from the nasopharynx, including the fossa of Rosenmüller. Naturally the operation which accomplishes these results in the shortest time and leaves the fewest adhesions is the one to be selected.

**Treatment** of adenoids depends upon the condition of the child and the size of the growths. Examination usually shows marked lesions of the upper thoracic region and the upper cervical region; lesions of the occiput are occasionally found. Correction of these lesions results in better circulation, and often the adenoids disappear completely; this is usually the case when the size of the growth depends largely upon edema and congestion.



The diet of children with adenoids is usually inadequate. An excess of carbohydrates is almost invariable. Even when no excess can be shown by the mother's statements, an immediate removal of all sweets and all starches from the food for a few weeks often gives remarkable results.

If this treatment does not result in the disappearance of the adenoids, at least the child is prepared to undergo the operation excellently, and adenoids recur much less frequently in children who have had such treatment, both before and after the surgical removal of the adenoid growths.

Two operations are described, the finger technic and the instrument technic.

### Finger Technic

The operation best adapted to infants and small children is the finger technic. This is so because at this age the adenoids are merely a soft, meshy, spongy, vascular mass,—an overgrowth of lymphoid cells, held together by a network of loose connective or areolar tissue. No sharp cutting edge is needed to remove an obstruction of this nature. Further, no instrument can possibly conform to the various epipharyngeal spaces as does the finger. The digit is a perfectly adjustable instrument for these operations, particularly when it has been made sensitive by osteopathic practice.

**Technic:** Ether or nitrous oxide anesthesia may be used, and only enough to make the patient unconscious for the moment it takes to perform the operation. If the anesthetic is properly given there will be no uncomfortable after-effects, and the danger is really infinitesimal.

The patient is placed in the dorsal position on a table of the proper height, and at the moment prior to unconsciousness the patient's body is drawn up to allow the head to drop over the end of the table,—Roser's position. The purpose of lowering the head is to prevent the blood from entering the larynx.

The surgeon's index finger, with the nail closely trimmed, is then introduced by way of the mouth (palmar surface upward) into the epipharynx. By bringing the back of the end of the finger from above downward once on each side of the median line of the posterior wall of the pharynx the mass is separated into several parts. The divided growth is then easily removed by making the required pressure with the back of the finger and rubbing the posterior wall of the pharynx from side to side. It is then necessary to use the end of the finger to cleanse the adenoids from the sides of the nasopharynx—especially around the Eustachian eminences. This operation does not require more than one minute, and it most perfectly accomplishes the desired results. Further, there is no danger that an experienced operator will denude or otherwise injure the normal mucous membrane.

### Instrument Technic

Manifestly the finger technic just described is not applicable in all cases. In older children the mass is apt to be so hard and fibrous that it would be impossible or at least impracticable to remove it with the finger.

There are many instruments designed for adenoidectomy, all of which have some value. The LaForce pattern is good, as it encloses the excised mass in a small box-like arrangement and thereby removes the possibility of its becoming lodged in the larynx. It is not at all difficult, however, to lift the mass out of the throat with the ordinary adenotome. The drawback to all instruments designed for this purpose is that they cannot adapt themselves to the various conformations of the epipharynx. Therefore if sharp edged

instruments are used there are apt to be recesses filled with adenoid tissue which the curet will not reach. Therefore it is usually necessary to complete the operation by using the finger technic as above described. In the following technic the ordinary sharp-edged curet of the Beekman or Stubb type is used.

**Technic:** Anesthesia by ether is preferable, though nitrous oxide gas may be used. The patient is placed in the dorsal position with the head lowered, and a mouth-gag is inserted between the teeth. A good light, either direct or reflected, is necessary. The index finger is inserted into the nasopharynx to obtain a knowledge of the shape and size of the mass, and also to learn the form of the epipharynx. The curet, held in the right hand, is passed through the fauces upon its side, with the upper end pointing toward the right wall of the pharynx. After the fauces are passed the curet is turned to the upright position. The handle is held well down, and the cutting edge is made to engage the uppermost part of the mass. By giving a slight rocking motion to the curet it is easy to tell when most of the mass is within the shanks of the instrument. The curet is next brought from above downward—care being taken to keep in the median line so as not to injure the Eustachian eminences—until the adenoids are entirely severed from the posterior wall. Then by a quick pull forward the mass is lifted into the mouth. Finally, the index finger is inserted into the nasopharynx and the remaining shreds of adenoid tissue removed, as in the finger technic. The use of the curet without the subsequent insertion of the finger is responsible for much scar tissue formation in the epipharynx.

The after-treatment consists of rest in bed, a milk diet, and the regular osteopathic care until all soreness is gone.

## THE TONSILS

The general usage of the name tonsils has made it superfluous to prefix the word faucial in order to distinguish these organs from the pharyngeal and lingual tonsils of a similar structure.

These organs, two in number, are situated between the anterior and posterior pillars of the fauces; and the fibrous capsules which cover their outer surfaces are in contact with the superior constrictor muscles of the pharynx.

The tonsils grow rapidly during childhood and reach their full size at puberty. Shortly after this period they are most susceptible to disease, since normally they should then begin to atrophy. Because of this we seldom find structurally diseased tonsils in children; but acute inflammatory diseases often followed by permanent pathological structural changes frequently occur. These diseases are named according to their cause and the portion of the tonsil affected.

## FOLLICULAR TONSILLITIS

Follicular tonsillitis, the most frequent of these inflammations, is caused by pathogenic germs, usually the streptococcus or staphylococcus, infecting the tonsillar crypts. However, this infection is usually made possible by a weakness of the lining mucous membrane of the crypts due to a structural lesion interfering with their vascular tone and innervation.

The tonsils are enlarged and painful. Severe headache, muscular pains, fever and other systemic symptoms are present.

The disease is indicated by yellow spots upon the surface of the tonsil which correspond to the orifices of the crypts and by the serofibrinous material which exudes from some of the follicles. This secretion, which is composed of devitalized epithelium and necrotic detritus of various kinds, sometimes covers a part of the cortex and somewhat resembles the pseudo-membrane of diphtheria, although it lacks the consistency, toughness, and peculiar gray color of the latter. Furthermore, it is limited to the surface of the tonsil and does not spread to the uvula, soft palate, or the other adjacent tissues, as the diphtheritic membrane is apt to do.

**Treatment.** After such correction of the lesions of the cervical and upper thoracic region as is possible has been secured, local treatment to the tonsils may be given.

With the first finger, long, firm steady stroking movements from the angle of the jaw along the anterior edge of the cleido-mastoid muscle downward toward the sternum facilitates the drainage from the tonsil. This should require not more than two or three minutes of time.

Mandibular lesions may become recognizable while this is being done; such lesions should be immediately corrected.

The treatment includes rest in bed, plenty of water, with or without lemon or orange juice. It should be remembered that here, as well as in other parts of the body, acute inflammation subsides much more quickly if no food is given.

If the bowels do not move normally they should be aided by manipulative treatment, enema or cathartic.

The body must be kept at an even temperature, in a well ventilated room. The child should not be allowed to get out of a warm bed to sit on a commode, but instead the chamber or bed pan should be warmed and placed in the bed and the covers should be carefully kept around the patient.

The tissues surrounding the inflamed area should be thoroughly relaxed by manipulative treatment in order to give free drainage and thereby relieve the venous and lymphatic congestion. The child should also be given thorough relaxing and structural adjustive spinal treatment to assist in the elimination of the waste products and maintenance of correct circulation.

The local treatment depends of course upon the age of the child and the acuteness of the inflammation. The exudate may be dislodged from the tonsil by swabbing or gargling with a weak peroxide of hydrogen solution. In older children any crypts which may remain diseased may be treated by direct irrigation with Dobell's or other solution. The instrument best adapted for this purpose is a large tonsil syringe with a long, curved beak.

### ULCERATIVE TONSILLITIS

This form of tonsillitis is recognized by patches of gray film upon the upper surface of the tonsil, which when removed discloses an ulcer. The gray patch is due to necrosis of the mucosa caused by invading germs, a fusiform bacillus and a spirillum.

The symptoms and general treatment are similar to those given for follicular tonsillitis. But the local treatment must be thoroughly germicidal. Tincture of iodine may be applied directly to the ulcer. Thereafter at intervals of several hours an application of an eight per cent solution of silver nitrate may be used in the same way. These remedies, if applied thoroughly and regularly will destroy the germs, and recovery will take place in a short time.

### HYPERTROPHIC TONSILLITIS

The chronically enlarged tonsil usually occurs during childhood and is generally the result of repeated attacks of acute inflammation. It is therefore often only a stage of the pathological process preceding the flat diseased tonsil which develops after puberty due to necrosis of the tonsillar tissue.

Hypertrophied tonsils in children, when there are present only vascular factors, respond quite promptly to osteopathic non-surgical treatment.

The fact must be recognized that diseased tonsils favor the development of the most virulent types of throat affections, as well as acute and chronic otitis media, mastoiditis, rheumatism, heart lesions, appendicitis, toxemia, neuritis, and other serious conditions. It is rare to find a case of diphtheria in throats where there is no disease of one or more of the organs comprising the tonsillar ring. Hence a clean enucleation is by all means necessary for diseased tonsils.

#### The Tonsil Operation

The operation to be selected is the one which obtains the desired results in the shortest time, without injuring the peritonsillar tissues, and with the least inconvenience and risk to the patient. The patient should be carefully examined prior to the operation, and if there are the slightest symptoms to suggest heart, lung, urinary or blood complications, the suspected organs must be minutely tested. These precautionary measures will prevent an occasional post-operative complication which is very undesirable from every point of view.

General anesthesia is preferable for this operation. The patient after being physiologically prepared is placed upon a suitable table in the reverse Trendelenburg position, or upon an ordinary table in Roser's position. A mouth-gag is inserted between the teeth, and the assistant places a tongue depressor on the side of the back of the tongue in a manner to hold it well away from the lower portion of faucial arches. It is also the assistant's duty to remove the excess mucous and blood from the throat by using gauze sponges or the suction apparatus. The tonsil is seized with a strong, light tonsil forceps and pulled toward the median line. The knife is then inserted between the tonsil and the anterior pillar at the lowest junction. If necessary the incision



is made through the plica triangularis and is then continued upward to the superior lobe of the tonsil. The incision is carried above and behind the supratonsillar lobe, and is then continued downward to the glossal margin. By this procedure the tonsil is dissected from the anterior and posterior pillars, as well as being partly separated from its tonsillar bed. The wire of a tonsil snare is then slipped over the forceps and the loop is carefully adjusted around the base of the tonsil. The wire loop is made tight enough to have a hemostatic effect, and is left in this position until the surgeon is satisfied that the bleeding will be under control, then by further tightening the loop, a complete enucleation of the tonsil is accomplished.

If there is doubt as to the thoroughness of the operation the finger should be inserted into the tonsillar fossa, and any remains of tonsillar tissue will be quickly detected by the contrast in texture between them and the muscular bed. All such tissue should be removed.

The danger of severe hemorrhage is very much less if the tonsillar fossa is not unnecessarily disturbed by packing or other manipulation after the enucleation. It is usually advisable to wait until the capillary oozing stops and then draw the anterior pillar out of the way with a pillar retractor or a small tenaculum. Careful search for a bleeding artery should then be made. If a bleeding point is found it should be picked up by a long hemostat, and twisted. If this procedure does not control the bleeding artery it should again be grasped and ligated by using a small curved needle threaded with silk of medium size. With this the thread is carried through the adjacent tissue and is tied so as to include the bleeding vessel.

Finally, the fact should be recognized that the tonsil operation is not a simple procedure. On the contrary, it is likely to make such demands upon both knowledge and skill that no one should undertake it who does not thoroughly understand the anatomy of the tonsil and peritonsillar tissues including their blood and nerve supply. Also, it is necessary to acquire the operative technic under the guidance of an expert who has a thorough knowledge of the complications which may occur and who knows how to manage them.

## CHAPTER XXX

### ASTHMA AND OTHER DYSPNEAS

Difficult breathing is a symptom in several pulmonary diseases, and these are discussed elsewhere. The more common causes of dyspnea are those associated with impeded passage of the air through the respiratory tract, as in the presence of adenoids, nasal polyps, foreign bodies, enlarged tonsils, enlarged bronchial lymph nodes, the pressure due to Pott's disease, the swelling of retropharyngeal or retroesophageal abscess, or other conditions affecting the lumen of the nasal, pharyngeal, laryngeal, tracheal or bronchial passages; circulatory disturbances, with the associated edema of the tissues; and functional variations in the activity of the non-striated muscle fibers of the smaller bronchial tubes.

In order that the etiological factors may be understood, it is necessary to consider the nerve relations of the respiratory apparatus, and especially of the lungs.

The vagus carries efferent constrictor fibers to the finer bronchial tubes and bronchioles, and sensory fibers whose stimulation initiates inspiration.

The vasomotors of the lungs are derived from the spinal centers, chiefly those of the third to the sixth thoracic segments. The white rami fibers concerned pass to the stellate ganglion and the middle cervical ganglion, and to the sympathetic ganglia upon the aorta. Grey fibers, axons of the sympathetic cells, pass in part to the vagus, to be distributed with its branches, and, in part, follow the arteries and arterioles to their destinations in the lungs. These spinal centers control the nonstriated muscle fibers of the bronchioles to some extent. They seem to act as antagonists to the vagus in this respect.

The respiratory center in the medulla controls breathing. It must be remembered that inspiration is the active and expiration the passive phase of breathing, and that whatever stimulates the respiratory center acts chiefly by initiating or prolonging inspiration. It is rare that any form of stimulation causes activity of the muscles of forced expiration. The respiratory center is stimulated by the increase of the carbon dioxid content of the blood passing through it, and by the algebraic sum of the nerve impulses reaching it. Stimuli of the sensory nerve endings of the vagus stimulate the respiratory center very efficiently and unusual stimulation of nerve endings anywhere in the body may stimulate this center. With few exceptions, any stimulation of this center initiates inspiration; this must be remembered.

The superior thoracic inlet is oval in form, and since the ribs are normally placed at a right angle to the spinal column, it is normally as large as the size of the bones permits. The many structures passing through this inlet,—muscles, blood vessels, lymphatics, trachea, esophagus, the common sheath in which the carotid artery, the jugular vein and the vagus nerve all lie closely associated,—these occupy the entire space.

If the upper ribs droop, as they may in weakly children; or if the muscles of the anterior aspect of the neck become unduly contracted and raise the upper ribs, the thoracic inlet becomes diminished, and pressure is brought to bear upon the various tissues occupying that space. Contracted muscles take up more room than relaxed muscles, and thus increase the crowding. As a result, the liquids passing through this inlet are somewhat impeded; the thin-walled veins and lymph channels suffer greater distortion than the thicker-walled arteries, or the nerves with their medullary sheaths. However, the vagus nerve, in its close proximity to the pulsating carotid artery, is subjected to mechanical stimulation, and thus any one or more of several disturbances may result: contraction of the bronchial tubes, bradycardia, gastro-intestinal disturbances, or other less well-known effects are produced.

Lesions of the cervical vertebrae cause contraction of the anterior cervical muscles, and thus diminish the size of the thoracic inlet. Such lesions cause also edema of the adjacent tissues, and pressure upon the neighboring sympathetic ganglia.

Lesions of the upper thoracic vertebrae interfere with the spinal control of the bronchial muscles, and these are left under the uncontrolled stimulation of the vagus fibers. Lesions of these vertebrae also interfere with the normal vaso-motor control of the blood vessels of the lungs. Congestion results, and this is associated with edema of the bronchioles and the neighboring tissue. Congestion and edema both diminish the size of the lumen of the affected bronchioles. During inspiration, as the alveoli follow the walls of the expanding chest, the air flows easily. When expiration begins, the pressure of the relaxing chest walls causes still further diminution of the lumina of the affected bronchioles, and the flow of the air is considerably impeded. The air thus retained becomes increasingly carbonic in character, and loses its oxygen abundantly. The blood flowing around the affected alveoli becomes increasingly venous. This blood, reaching the respiratory center, stimulates it, and further attempts at inspiration are initiated; hence the increasing difficulty of relaxing the chest walls; in other words, increasing expiratory dyspnea.

Abnormal stimuli from any part of the body may stimulate the respiratory center and promote exaggerated inspiratory activity.

While these rarely cause marked effects, since the affected centers usually soon become fatigued and since a considerable amount of functional adaptation is possible within the nervous system, yet in some cases this is a serious cause of asthma.

Certain poisons act upon the nerve endings, and these seem to have a selective effect in some cases. The poisons of anaphylaxis, for example, seem to stimulate the vagal nerve endings especially. Animals dying from anaphylaxis seem to die from suffocation, the results of excessive contraction of the bronchial muscles. The place of anaphylaxis in the etiology of certain types of asthma must be recognized.

The dyspneas include several types.

**Pulmonary** disease of almost any kind may produce paroxysmal dyspnea. The presence of the evident pulmonary disorder, with the absence of eosinophilia in the blood in difficult cases, makes the diagnosis apparent.

**Cardiac** asthma is very rare in children. It is not truly an asthma, but is a paroxysmal dyspnea, often expiratory in character, and due to heart disease. The pulse is very irregular and weak, the patient is pale, distressed, very weak and seems about to die,—and is rather apt to die very soon, from the first or a later attack. No eosinophilia is present.

**Renal** asthma is very rare in children. It is a paroxysmal dyspnea, probably due to pulmonary edema, and usually easily recognized in the few cases in which it does appear. It is not really a form of asthma at all. Eosinophilia is not usually present.

**Thymic** asthma also is properly a dyspnea and not an asthma. It is due to the pressure of an enlarged thymus upon the trachea or bronchi, and the breathing is irregular and difficult, but not expiratory. The blood shows excess of small hyaline cells, but no eosinophilia.

Dyspnea may be due to the pressure of enlarged bronchial lymphatic nodes, and this may be associated with true asthma. The presence of eosinophilia indicates the presence of true asthma. In thymic asthma and in the dyspnea due to enlarged bronchial lymph nodes, some dyspnea may be induced at any time by increased exercise; this is not the case in uncomplicated asthma.

All of these forms of dyspnea are sometimes called "false asthma". The term "dyspnea" should be used instead of "asthma" in those cases in which the characteristics of true asthma are not present. Asthma is sufficiently complicated at best, and further perplexing factors should be omitted.

True asthma warrants more extended discussion.



### Asthma

Asthma is a symptom-complex rather than a distinct disease. It is characterized by expiratory dyspnea, eosinophilia, and its appearance in sudden attacks. Its prevalence during childhood is difficult to determine, because different authors use the term in different meanings. For this reason also there is much variation in the etiological factors mentioned by different authors. In this discussion, the term is applied to the symptom-complex as just stated, and the etiological factors accordingly include all factors which cause these three associated conditions, expiratory dyspnea occurring in paroxysms, and eosinophilia.

**Etiology.** Bony lesions of either the upper ribs, the cervical and the fact that the asthma permanently disappears on their correction, sole cause of asthma. In other cases, such lesions are factors of varying importance in etiology. The recognition of the lesions, and the upper thoracic region, or any combination of these, may be the demonstrates this factor.

Anaphylaxis is important in a certain group of cases; it may be the sole cause. Tests for the different proteins are easily made, and if the asthma permanently disappears with elimination of the anaphylactic factor, the etiological importance of this is proved.

Vagotonic asthma is due to abnormal conditions affecting either the vagus or related nerve centers. Constipation of the spastic type, with occasional attacks of diarrhea, mucous colitis, bradycardia, and peculiar and various disturbances in perspiration and in heat control are associated with asthma of this type. This type is probably rare in children.

Bronchial asthma is associated with catarrhal inflammation of the bronchial tubes, though such inflammation provokes asthmatic attacks only in a few children. Griffith emphasizes the difference between asthmatic bronchitis and bronchial asthma, and he recognizes intermediate cases in which the diagnosis is uncertain. The relative preponderance of the nervous symptoms or the catarrhal symptoms provides the differential diagnosis between the two types.

Constitutional, or idiopathic asthma, occurs rather frequently in babies and children. This type of asthma is associated with attacks of urticaria or eczema or both at different times, and attacks of these seem to act as equivalents for the asthma. Children subject to this type of asthma belong to a family in whom such attacks are common; or it may be that an inheritance of rheumatic or gouty tendencies is found. In these cases, the possibility of hereditary or congenital anaphylaxis may be considered.

In any given case, any combination of the factors mentioned may be present. The differential diagnosis presents many difficulties,

and in many cases only therapeutic tests give satisfactory information.

Laboratory findings are important. The sputum in asthma is usually characteristic. Eosinophiles are always abundant. If, in a case supposed to be asthmatic, the sputum shows few or no eosinophiles, another form of dyspnea should be suspected. Charcot Leyden crystals, Curschmann's spirals and Laennec's pearls are found in the sputum of older children, but not in the sputum of babies or young children, even when this can be secured for examination.

The blood of a child with asthma always shows marked eosinophilia, usually to 10% or more, and sometimes to 30%. This is practically invariable, and in any case in which eosinophilia is not present, some other form of dyspnea should be suspected.

**Diagnosis.** The diagnosis of asthma rests upon the characteristic attacks of expiratory dyspnea and the eosinophilia. In doubtful cases, the presence or absence of eosinophilia decides whether asthma or some other form of dyspnea is present.

The symptoms are fairly constant. The child may or may not show symptoms of catarrhal bronchitis during the day preceding the attack. The attacks are more frequent at night. The child awakes wheezing, breathing with long and sometimes forced inspirations. Only after considerable effort and discomfort is expiration permitted. The expiration, when it finally does occur, is long and gives marked relief. This comfort is only brief; the next inspiration is equally prolonged. The face is always anxious; the child seems fearful; there may be cyanosis. The pulse is rapid, and sometimes weak, and irregular. Fever is never present in uncomplicated cases. Subnormal temperature often follows cyanosis. Orthopnea is urgent; the child sits up in bed with the shoulders thrown back, and all the accessory muscles of inspiration are brought into play. After a variable time (which seems greater than it really is, on account of the severity of the symptoms) the child seems exhausted, the breathing becomes easier, and he falls into deep sleep. The attacks may appear at intervals of several months, or several attacks may occur during one night.

In other cases, typical attacks do not occur, but at intervals the child suffers from milder attacks of wheezing and dyspnea. In these cases, apparently milder in symptoms, the eosinophilia is apt to be higher than in the typical cases.

The physical findings include a large and rather rigid thorax, with inflexible costo-vertebral and costo-chondral articulations. Lesions of the upper thoracic and cervical spinal column are practically invariable. Rales are abundant; they are more marked during the attacks, but are usually recognizable during the intervals. According to the varying air pressure and the varying muscular tension of

the bronchial muscles, the rales may be loud, whistling, wheezing, sibilant, sonorous, fine, coarse, dry or moist, varying from minute to minute. A peculiar "music box" rale is often noted late during an attack, and, in some children, may be heard during the intervals.

The recognition of the type of asthma present in any case may be a matter of great difficulty. Bony lesions are present as complicating if not as the essential etiological factors.

Pressure conditions affecting the respiratory passages or the vagus nerve are found by examination. The X-ray may give definite information in certain cases.

Anaphylaxis may be determined by a history of sequence between eating certain foods, visiting certain places, exposure to cold, breathing certain odors or effluvia, acute infections or other conditions, and the onset of the acute attack. The protein tests, by means of skin reactions, are simple and may give accurate information.

**Treatment.** Inhibition of the muscles around the lesioned area may give instant relief, or may produce no effect. Expiration may be facilitated by regular pressure upon the thorax, but in some cases this increases the distress.

Inhibition through the midthoracic region gives relief in many cases. Raising the ribs with a rather slow and steady, rhythmic motion, with forced, regular breathing, relieves many mild cases.

The attack may usually be relieved by the inhalation of steam. Any pleasant substances may be added, such as cedar or eucalyptus. Unless this seems particularly desirable, the steam alone gives relief in most cases.

The smoke from burning stramontium leaves, or from burning paper soaked in a 1:15 solution of potassium nitrate and dried, is a classical treatment which has yet many advocates. These are probably harmless. There is some reason to believe that the carbon dioxid has some good effect.

Steam derived from quick lime, sprinkled with water, contains also some carbon dioxid, and may be somewhat more efficacious than the steam from boiling water.

Steadfast and kindly demeanor helps; there is usually a large emotional factor to be met firmly, but in a kindly manner.

During the intervals treatment should be given for permanent relief.

The lesions as found should be corrected. Any mechanical impediment to the respiratory path should be removed; this includes adenoids, polyps, and abnormal uvula, as well as diminished thoracic inlet, and other less common conditions.

The influence of the vagus must be considered. Anything which might exercise pressure upon the vagus, or which might increase

the irritability of the vagus center, must be eliminated. Recent investigations seem to show a definite relation between the action of the vagus and its antagonist, the sympathetic ganglia and the related spinal centers; hence the condition of the upper thoracic vertebrae must be made normal, if any lesions are present.

Anaphylaxis is difficult to manage. The different proteids should be tested by means of the skin reaction, in order to determine whether anaphylaxis to some particular proteid exists. In some cases, the child is sensitized to the emanations of a pet dog or cat or rabbit; the removal of the pet results in complete recovery. Some article of food may be responsible; in this case it is probable that a small amount of the unchanged proteid of that particular food reaches the blood stream as a result of the disturbed circulation of the digestive tract, and that sensitization was thus produced. The elimination of this food from the diet results in complete recovery.

The offending proteid may be one of the important articles of food for the child, or it may be that the child is sensitive to a considerable number of foods and he seems confronted with a choice between starvation and asthma forever. In these cases, immunity may be conferred by feeding him extremely minute amounts of the offending proteid, and then by increasing this amount very gradually. Subcutaneous injections have been used in the same way. This is theoretically correct, but unfortunately the process of immunization is often complicated by very severe attacks of asthma, and often of severe urticaria also.

The point of entry, it must be remembered, is by way of the respiratory tract or the digestive tract. In the case of emanations from animals, the respiratory tract provides the gateway; the elimination of the offending animal is usually easy. In the case of the digestive tract, a more complex matter is seen. If the digestive juices and the walls of the digestive tract were normal, it seems probable that no unchanged proteid could reach the circulation. The thing which is to be done in these cases is to correct all conditions which might be responsible for disturbances in the physiological activity of the digestive tract. That this is important is indicated by the fact that in many cases of anaphylaxis, osteopathic treatment correcting splanchnic lesions has secured proper digestion of the offending proteids, and the foods which had previously been tabu on account of the anaphylactic phenomena became harmless and proper sources of nutrition.

The most common food proteins causing anaphylaxis are egg, cow's milk, orange, chocolate, oat-meal, barley and rice. Rarely a baby becomes sensitive to human milk; more rarely, to his mother's milk.



Anaphylaxis applies also to bacterial products. A child may be sensitized to the products of bacteria which grow upon adenoid tissue or to those which infect tonsils, or, in older children, an abscess at the root of a tooth. At intervals, when such bacteria engage in rapid growth, the products of this activity are absorbed into the circulating blood, producing typical anaphylactic attacks. In such cases, the obvious treatment is the removal of the infectious focus.

Asthmatic children are usually subject to attacks of bronchitis. They should receive the treatment indicated for this condition, the removal of bony lesions; judicious increase in the time spent out of doors; increasingly plentiful ventilation, especially of sleeping rooms; elimination of any dietetic excesses, especially of starches and sweets, and the establishment of regular meals with balanced and nutritious diet. Anything which interferes with breathing should be removed according to the methods most suitable to the child. Change of climate is often useful in these cases; preferably to a warm, dry climate in a high altitude. There are children, however, who improve much more rapidly at sea level, others who do best in a cold, dry climate, and still others who find health only in damp, cool atmospheres. It usually is found that a child is free from attacks during certain kinds of weather; this gives some indication of the nature of the climate which should be tried for him.

### Hay Fever

This disease, common in older children and in adults, is rare in early childhood, and is almost never seen in infancy. It is a type of rhinitis, occurring in children predisposed, and excited by odors, pollen, or other irritants. The predisposition depends upon several varying conditions. Bony lesions are constant, usually cervical. A nervous temperament is usually present, though its etiological importance is not understood. Irritating conditions of the nasal mucous membrane, such as abnormal structures of the nasal passages, lesions of the cervical and upper thoracic spinal column, and the inhalation of dust, are predisposing factors. Anaphylaxis seems to be very important in some cases.

**Diagnosis.** The symptoms include sudden acute coryza, occurring almost at once upon exposure to the particular irritant to which the child is sensitive; the odors of peaches, violets, roses, onions; or the pollen of ragweed or golden rod or other flowers or weeds; or the emanations from horses, cats, rabbits or dogs; or any one of several other irritating factors. The conjunctivae shares the inflammation, and the tears are very profuse. The increased secretion from the nasal membrane causes irritation of the skin around the nostrils; sneezing is violent and frequent, and the discomfort is serious. Asthmatic attacks are often associated with the rhinitis.

The attacks recur at each exposure to the irritating factor; in "rose cold" attacks appear each year with the blossoming of roses; if golden rod or ragweed supplies irritating pollen, the attacks appear when these are in bloom; if the emanations of horses or other animals is the specific agent, the child suffers an attack whenever those animals are in his vicinity.

**The treatment** depends upon the cause of the disease in each child. A careful examination of the nasal passages should be made, and any irritating conditions corrected, during the intervals between attacks. Lesions of the cervical and thoracic vertebrae should be corrected.

At the onset of an attack, heavy treatment affecting the cervical and upper thoracic spinal column and the upper ribs, may give immediate relief. The child should not be exposed to the irritant if it is possible to avoid it. Change of climate sometimes gives permanent relief, even though the particular irritant is not found.

The use of drugs for the relief of the attack is very tempting, but this must be avoided, resolutely. The drugs which give relief form habits with dangerous ease; the attacks are increased by the use of drugs, and the removal of the primary cause of the disorder is rendered much more difficult if these further causes of disturbance have been employed.

## CHAPTER XXXI

### DISEASES OF THE LARYNX

The diseases of the nose and throat have already been discussed. The larynx and trachea are often affected by diseases of the nose and throat, but may suffer alone under certain conditions. The conditions are very much like those affecting similar tissues in adults, with a few additional causes of disturbance. Nearly all of the acute infectious diseases are initiated by throat symptoms, and the larynx is often affected rather seriously at the onset of such diseases.

The laryngeal diseases in children are characterized by a marked tendency to laryngeal spasm. Even apparently slight catarrhal laryngitis may be associated with very serious symptoms. Neurotic children are especially apt to suffer in this way, and such children often suffer with asthma later in life.

Laryngeal diseases are commonly associated with diseases of the throat, and the inflammation of the larynx is a part of the general inflammatory condition. The etiology, symptoms and treatment of the various laryngeal diseases present so many points of similarity that they will be discussed together, and the differences considered in separate paragraphs.

#### **Etiology**

The causes of laryngitis are about the same as the causes of pharyngitis, with which it is usually associated.

Subluxations of the mid-cervical and the upper thoracic vertebrae are predisposing causes. The hyoid and the axis are especially important. Contractions of the anterior cervical group of muscles predispose; these diminish the size of the thoracic inlet and interfere with drainage of the laryngeal and pharyngeal tissues. The larynx is rather more often affected by these than are the upper pharyngeal tissues.

Any of the acute infectious diseases may be associated with laryngitis and this is the more apt to be the case when the lesions mentioned are present.

Inhalations of dust or irritating fumes; the entrance of foods or liquids into the larynx; infection from neighboring pyogenic foci, these are rather common causes of laryngitis. A very common cause is excessive crying; mothers who have pronounced ideas of training children allow them to cry excessively, sometimes. An irreparable injury to the larynx and the voice may be produced in this way.

## Types of Laryngitis

**Acute Catarrhal Laryngitis** is one of the most common forms of laryngitis caused by the conditions just mentioned. The inflammation is of the ordinary catarrhal variety, with edema of the mucous membrane, redness, dryness, and later an oversecretion of mucus. Pain is slight, but may be marked; hoarseness depends upon the extent of the inflammation. Usually only the upper areas of the larynx are involved, and the membranes covering the vocal cords are not affected; in this case the voice remains normal.

In other cases the vocal cords are affected; the mucous membrane and the submucous tissues may become edematous; hoarseness is then invariable, and the voice may be lost completely for a time. A dry, hoarse cough is usually present with the latter type, and may be present in the milder forms of the disease.

The temperature is usually elevated; rarely above 101° F. The child does not seem very ill, and recovery is to be expected within a few days.

**Spasmodic Laryngitis** (spasmodic croup; laryngitis stridulous; false croup) is associated with the catarrhal form in certain cases. There is no definite line between the diseases, and all intermediate types may be found varying from acute, mild or severe catarrhal laryngitis with no spasm, those with slight spasm, to those with either severe or slight catarrhal inflammation and very severe spasm of the laryngeal muscles. This disease is most common after the age of two years and before the age of five. Many children never have an attack; others seem to suffer from croup almost as a habit. Children with rickets, adenoids, and chronic pharyngitis are prone to croup; children who eat starchy foods, sweets and candy to excess are especially subject to croup as well as to pharyngitis and adenoids. Over fat children are often severely affected. This form of croup is sometimes a manifestation of tetany (q.v.).

The symptoms are definite. The attack may or may not be preceded by coryza, hoarseness, symptoms of slight fever, or definite symptoms of acute laryngitis. Early in the night the child has some dyspnea, a hoarse, barking "croupy" cough, and noisy breathing. The child sits up with a hoarse cry and presents evidences of impending suffocation. The face is congested and anxious, cyanosis may be marked; all muscles of forced respiration are brought into action. The voice is very hoarse, and the child is apt to cry in terror; this increases the suffocative symptoms. The pulse is increased in rate; the skin is moist; there is little or no feverishness; it is the appearance of impending suffocation that causes the frightfulness of the symptoms.



In addition to the usual treatment for laryngitis, the inhalation of steam; tickling the fauces to induce vomiting, and the administration of abundant warm water or weak mustard water, for the same purpose, may give instant relief.

“An effective local treatment can be given through the mouth upon the hard and soft palate. Introduce a finger into the mouth, back upon the roof to the soft palate, give a downward and backward sweeping movement from the median line on either side towards the tonsils; considerable relief is thus given to the patient.” McConnell & Teall, 1920.

**Acute Subglottic Laryngitis** (severe laryngitis; inflammatory edema of the larynx; submucous laryngitis) is a later stage and a more severe form of catarrhal laryngitis. The inflammation spreads to the mucous membrane of the vocal cords and the deeper tissues are affected also.

Fever is marked; the temperature may reach 104° F. or more. Anorexia, thirst, prostration, tachycardia, are rather more marked than the temperature seems to warrant. The cough is severe, painful and croupy in character. Pain in the throat and dyspnea are usually severe; an annoying tickling in the throat may cause greater discomfort than the cough. A dull aching is mentioned also. Attacks of apparent suffocation, such as occur at night in milder cases, here occur during day or night, and dyspnea may be present in serious degree more or less constantly. Weakly children may die during one of these attacks.

Inflammation of the trachea and bronchi usually follows; bronchopneumonia may result, and such cases are apt to be fatal. Rarely intubation is necessary. The disease may be confused with diphtheria, in atypical cases.

**Pseudomembranous Laryngitis** is usually diphtheritic. Rarely it is due to infection with streptococcus, pneumococcus, or other pyogenic bacteria. A false membrane spreads over the throat; this is composed of fibrin, leucocytes, pus cells and abundant bacteria of the variety concerned in the etiology.

**Case Reports.** “Two cases of Pseudo-Diphtheria were in the same family—boy of five and girl of eight years old. Ulcerated patches, very irregular, were found on the anterior pillars with a decided grayish membrane—the membrane could be removed without bleeding.

“The temperature, especially of the boy, was peculiar, starting at a temperature of 104°, which remained for twenty-four hours, then dropping to 101° and remaining between 99° and 101° for two weeks.

“Three different cultures were taken with two negative and one slightly suspicious report. Fourth culture when temperature was normal—child doing very well—was positive—fifth culture negative. Streptococcus was absent.

“Vincent’s Angina has been very common in the last year, 1921-1922. The typical ulcers appearing on the anterior pillars and neighboring gums, with

a slight membrane and the constitutional symptoms being negative should make one think of Vincent's Angina.

"Treatment. I treat the cervical area for the fever and drainage of the neck and upper thorax. I see that each vertebra moves by holding, say the seventh cervical and moving the sixth on it all the way up the cervical area, and when I move each I do no more to that area. I treated the splenic area similarly by holding the tenth rib and lifting the ninth from it, etc., over the area.

"Dietetic. In the suckling I dilute the milk one-half the normal during the fever. If the baby is nursing, I first give three ounces of water and then the breast, etc. In a "runabout" who is normally on solid food, I take away all solid food until the temperature is normal, giving only water, fruit juices and thin cereal and gruels."

MARJORIE M. JOHNSON, D. O.

**Chronic Laryngitis** is uncommon in childhood; and is hardly ever found in infancy. It may follow acute attacks, or may be primary, and due to the same conditions as those responsible for the acute form, in children whose resistance is too great to permit the acute inflammation, and still is too slight to overcome the etiological agents altogether.

The bony lesions mentioned in the paragraph on etiology may prevent recovery from an acute attack, or may permit recurring attacks which become chronic. Adenoids are often present; or the disease may be syphilitic or tubercular, though these also are rare.

Hoarseness is usually present, and attacks of aphonia may occur. Suffocative attacks are not frequent, but may be severe. A brassy annoying cough is usually present, and this may be painful. The syphilitic and tubercular types are discussed with those diseases.

**Laryngeal Perichondritis** may be due to the extension of the less severe inflammatory processes, or may result from trauma produced by intubation. The arytenoid and the cricoid cartilages are most commonly affected. The process may be either necrotic or pyogenic. The latter condition is preferable; with the evacuation of the abscess recovery may be rapid, though rarely complete. The pressure of the abscess or of the edema associated with the necrotic or pyogenic process may cause death rather suddenly.

**Edema of the Glottis.** This condition may result from any one of several causes, associated with the etiological factors already mentioned, and from certain other conditions. Nephritis, angioneurotic edema, cardiac disease, or any pressure condition which interferes with the circulation, may cause a serious edema. The inflammatory edema is associated with active pyogenic infection; perhaps the most common source of this is an abscess in neighboring tissues; a retropharyngeal abscess, for example.

The condition is characterized by inspiratory dyspnea, and very severe, usually very sudden, suffocative attacks like those of croup. In the serious type death may result, without any symptoms serious

enough to lead to such expectation. In the inflammatory type, fever may be very high, with all the symptoms due to the high temperature; cough, hoarseness, pain, dysphagia, enlargement of the lymph nodes, all suggest a serious condition.

**Neoplasms** are very rare at any time, of life, and especially in childhood. Papilloma may be congenital, or may result from repeated attacks of laryngitis. These may be sessile or pedunculated, and are usually attached to the vocal cords, though they may be found anywhere in the larynx. Suffocation may be caused by them at any time. Their surgical removal is indicated, after which the treatment for laryngitis should be given.

**Congenital Laryngeal Stridor** has been discussed as one of the diseases of the Newly Born.

### Treatment of Laryngitis

As in nearly all of the common diseases of children, the mother or nurse should apply the first therapeutic measures. The ailing child should be given a hot bath, or at least a hot foot bath with mustard, and an enema, and be put to bed in a room from which other children are excluded, if possible. If the symptoms are not speedily relieved, the family physician should be sent for.

In laryngitis, whether bony lesions are concerned in the etiology or not, the muscles of the neck and the upper thoracic region are tensely contracted. These should be relaxed by gentle manipulations; extension alone is usually most efficient. Lesions as found on examination may be corrected at once; occasionally the second or third treatment is necessary.

If gastric symptoms are pronounced, or if spasm is marked, vomiting should be excited; usually tickling the fauces gives most speedy results. Warm mustard water may be given if this does not accomplish speedy emptying of the stomach. Stimulating manipulations given to the muscles of the spinal column in the region of the fifth to the eighth thoracic vertebrae facilitate complete emptying of the stomach, after vomiting has begun.

Whenever pain or spasm are severe, inhalations of steam are very useful. Water sprinkled over quicklime is a classic method. The "croup kettle" or an improvised arrangement consisting of a tea-kettle and a towel or sheet to make a tent, gives the best results as a rule. Oil of pine needles, eucalyptus oil, benzoin, creosote, all are sometimes added to the boiling water, but these odors seem much less important than the steam which carries them. Any pleasant odor facilitates deep breathing. Any odor which is unpleasant may cause strangling and add to the sense of suffocation.

Hot fomentations around the throat; a mustard plaster or the application of any of the mustard-containing inunctions give relief.

If the dyspnea reaches so severe a stage that suffocation seems imminent, intubation may be necessary to save the life of the child.

After an attack of any form of laryngitis, treatment should be begun for the prevention of future attacks.

Corrective treatment must be given if any structural disturbances are found on examination.

The diet should be studied, and the amount of sweets reduced if there has been any excess; starchy foods should be diminished in almost all cases. Increased feeding of vegetables, both raw and cooked; the use of fresh fruits and also such dried fruits as dates, figs, raisins, and prunes, provide sweets that are satisfactory and harmless.

The resistance of the body is best increased by gradually increasing exposure to cold. The sleeping room should be well ventilated, if it is not already so; bedding must be warm; hot water bottles, electric pads, or warm bricks may be used to keep the child warm in bed, while the air he breaths is cool and fresh. The change must not be too sudden.

Clothing must be well judged. It should be light in weight, warm enough to keep the skin from chilling, but not so warm as to cause any sweating. Warm outer garments are, in general, better than underclothing which is too warm; excessive clothing is injurious to any child, anywhere. Climatic conditions and the nature of heating systems control the actual quality and amount of clothing; but it must never be habitually heavy, in any climate or condition.



## CHAPTER XXXII

### DISEASES OF THE TRACHEA AND BRONCHI

#### Acute Bronchitis

(Acute tracheo-bronchitis; Acute bronchial catarrh; capillary bronchitis.)

This disease is very common in childhood, especially during the first two years of life. It is not usually serious, though neglected cases may be fatal. Each attack predisposes to further attacks.

#### Etiology

**Hygiene:** The disease is more common during late winter and spring, during the period of sudden changes in the weather, much rain, and high winds. Exposure to chilly dampness, especially with wind, and especially for children who have lived in gloomy, unventilated rooms, is the most common exciting cause. Children who are kept too warm, customarily, are very apt to contract bronchitis upon slight exposure; while children who are unduly exposed to climatic changes also suffer. Children who eat an excess of carbohydrates, and especially those who eat much candy and other sweets at irregular intervals, are predisposed to this disease also.

**Lesions** of the first to the fifth thoracic vertebrae, the clavicle, and the first and second ribs, are important etiological factors. Such lesions, when chronic, predispose. In children whose physical condition is subnormal, the sudden traumatic production of such lesions may result in an acute attack of bronchitis.

**Bacteria** seem always to be associated with bronchitis. The acute infectious diseases have their onset very often in an attack of acute bronchitis. Pneumonia and pleurisy usually show also bronchial symptoms. Uncomplicated bronchitis shows usually the pneumococcus, staphylococcus and streptococcus. Other bacteria may be found occasionally. Such bacteria are present in greater or less numbers constantly, and it is only when they act upon tissues already subnormal that the inflammatory processes in the bronchi are initiated.

**Tissue Changes:** Pathological changes are not profound, even in fatal cases. The usual characteristics of catarrhal inflammation are present in the trachea and the bronchi affected. The areas involved give the prognosis in any given case; tracheo-bronchitis, with involvement of the larger bronchi only, is usually not serious, and recovery can be expected with confidence, if the child is in reasonably good health at the time of the attack.

When the smaller bronchi are affected, the prognosis is more serious, though still, with good treatment, recovery is to be expected.

Capillary bronchitis, in which the inflammatory process affects chiefly the very smallest bronchioles, has very serious symptoms, and the prognosis is very serious. Probably capillary bronchitis rarely exists without associated inflammation of the alveolar cells, which is the condition called broncho-pneumonia.

In all of these types, emphysema, lymphoid hypertrophy, and the filling of the bronchi and bronchioles with a thick, purulent secretion are common findings.

### Types of Bronchitis

**Tracheo-bronchitis** or bronchitis of the larger tubes is the milder type. The disease begins with catarrhal inflammation of the upper respiratory tract, nose, throat or larynx, or all of these. The cough begins within two days; it is at first dry, annoying, worse at night, and unproductive. The respiration is slightly accelerated; there may be fever of a hundred and one degrees Fahrenheit, rarely higher. Coarse rales may be heard, but percussion gives no more than normal findings. After a day or more, the cough becomes looser; the secretions may be coughed part of the way up, and aspirated into the bronchi again, or may be brought into the pharynx and swallowed. Older children may be taught to bring the secretions into the mouth and expectorate. The sputum is colorless and frothy at first, but becomes purulent later. Microscopical examination shows mucus, pus cells, leucocytes, ciliated epithelium and abundant bacteria, including many non-pathogenic types and any one or more of those mentioned in the paragraph on etiology,—pneumococcus, bacillus influenzae, staphylococcus, streptococcus, and, rarely, other pyogenic bacteria.

With correct treatment, in an otherwise healthy child, all symptoms diminish and disappear within a week. If the child is rickety, poorly nourished, subjected to continued exposure, improperly fed, and if no treatment, or improper treatment, is given, then the inflammatory process may extend to the smaller bronchi and bronchioles, and bronchopneumonia result; or recovery may be greatly prolonged, or the chronic form supervene.

**Bronchitis of the smaller tubes** resembles pneumonia, except that the symptoms are less severe, and the rales are not crepitant. Nursing is difficult for the baby. The cough is very tight and short, annoying, rather than painful.

After two days or so, it becomes looser, and abundant secretions may be produced; these are swallowed by infants and young children, but may be expectorated by the older children. The sputum is like that of the milder form, but may contain blood. The swallowed

material causes variable digestive complications, vomiting, anorexia, diarrhea, and these symptoms may be much more conspicuous than the pulmonary disease.

The temperature may reach a hundred and four degrees Fahrenheit, within the first day or so; it usually diminishes slowly thereafter.

Dyspnea, hyperpnea, prostration, restlessness, slight cyanosis, and moist, sibilant rales are present in all cases. Rales are heard over all the lung areas.

Children old enough to talk complain of headache, tightness and pain under the sternum, but rarely complain of pain from the coughing. Spasmodic contraction of the bronchial tubes may cause marked asthmatic breathing, either constantly or in paroxysms.

Infants under six months, or weakly babies, may suffocate as the result of the abundant secretion. In babies coughing is not very efficient, since the chest is almost round and the ribs are soft and cartilaginous; dyspnea increases until the respiratory muscles are exhausted, breathing becomes rapid and shallow, signs of discomfort disappear, and the skin is cyanotic and clammy; death occurs easily and quickly, in stupor or apathy; or, in more robust babies, convulsions may occur before death.

Babies over eight months old, and children, usually recover with proper treatment, if the disease does not extend to the bronchioles and alveoli, and if complicating factors are not present.

**Fibrinous bronchitis.** (Bronchial Croup) is a rare disease in children. There is a fibrinous exudate which coagulates within the bronchi, usually in a localized area, but occasionally affecting an entire bronchial tree; rarely on both sides. This pseudo-membrane may be coughed up in the sputum, and, when the sputum is floated on water, it unrolls, showing casts of the bronchial tubes affected.

This condition may complicate diphtheria, but aside from these cases, the etiology is not known. It is usually associated with other pathological conditions, as emphysema, pneumonia, or catarrhal bronchitis, but may occur independently of these. It is a more serious form of bronchitis, but recovery may be expected from the acute attack, with proper treatment. The prognosis is unfavorable in neglected cases. Recurrence is to be expected, and the disease easily becomes chronic.

**Capillary Bronchitis** (Bronchiolitis). Occurs when the inflammatory process extends to the finer bronchial capillaries, but does not cause the alveoli to be recognizably affected. Many authors doubt that this occurs, but others describe autopsy findings with marked inflammation of the capillary bronchioles, associated with dilated or normal alveoli. This type occurs, if at all, only in very

young or weakly babies, and the prognosis is very gloomy. Probably such cases are really only an early and speedily fatal bronchopneumonia.

### Treatment

The treatment of bronchitis depends upon the age of the child and the severity of the case. Children with mild attacks usually recover without any particular attention. Unless further attacks occur, no harm is done. Unless the cause of the first attack is avoided, later attacks do occur, and a chronic bronchitis may supervene; or a foundation is laid for tuberculosis.

On the appearance of symptoms of bronchitis, the child should be given an enema, a hot bath, and be put to bed. This the mother should do, as soon as the symptoms are noted. If the temperature is above a hundred degrees Fahrenheit, he must remain in bed until the fever is gone, or until further directions are given. Unless the symptoms are gone within twelve hours, she should send for her physician, if she has not already done so.

At least one treatment each day should be given during the acute period; it may be necessary to visit the child oftener in more severe cases, or if the child is weakly, or is a very young baby. Three visits each day are often required for these weakly infants, and the nurse must know how to find the physician at any time. Gentle and prolonged relaxing treatments affecting the interscapular centers are indicated. The ribs must be raised very gently. The muscles on the anterior aspect of the thorax require attention. The condition of the tissues around the superior thoracic inlet must be noted, and such relief as is indicated be given. Raising the ribs over the liver and the spleen, securing more efficient circulation through these organs, is usually required. By careful attention to all these factors, many structural conditions can be corrected, and these promote the better circulation and the more normal activity of the various organs concerned in overcoming infection and in establishing more nearly normal conditions of all the body.

The temperature of the sick room should be higher than usual during the acute stage of the disease, at least seventy-two degrees Fahrenheit, and it may be somewhat higher. Ventilation must be secured by methods which permit this heat to be steadily maintained. Cold air increases the coughing, and this facilitates the spread of the infection to the finer tubules and the alveoli. The condition here is not that in pneumonia, which is to be avoided if possible. Fresh, moist, well-warmed air is essential to speedy recovery.

No solid food should be given during the fever; water and diluted fruit juices may be given freely. Milk or broths should not be given during the fever.



**Cough:** For the relief of the coughing, especially during the first days, when the cough is dry and annoying, the inhalation of steam is excellent. This is best managed by means of a croup kettle, or by an ordinary tea-kettle whose spout is attached to a piece of rubber hose; the other end of the hose passes into a tent, made by placing a sheet over a frame which covers the head of the child. The steam thus is carried into the tent, and is breathed by the child; this may be kept up for five minutes or more, and then a rest is taken; the child breathes for a time the ordinary air of the room. This inhalation of steam may be repeated for a few minutes as often as the cough is annoying, with about twenty minutes of rest between periods of inhalations.

Ordinary steam is usually efficient, but many aromatic substances are often added to the boiling water,—the essential oils, such as eucalyptol, cedar, creosote,—seem to please the child and do no harm. Odors obnoxious to the child may cause strangling. Steam made by adding a small amount of water to quick-lime contains carbon dioxid as well as watery vapor, and this may be more comfortable.

Counter-irritation may be helpful, especially in the early stages of the disease when the cough is dry and harsh. Mustard may be applied to the chest until slight reddening is produced; the old-fashioned mustard plaster, or any of the mustard preparations with oil may be used. The plaster should be applied over the back or sides, over the ribs. It is not usually good to put them over the front of the thorax.

When the breathing is difficult, as in weakly children, a cage or frame should be used to support the weight of the bed clothes.

**Emergencies:** If an attack of respiratory failure should appear imminent, the child should be subjected to stimulation. The arms and legs should be rubbed with warm flannels; or the child may be placed in a mustard bath, or may be given the usual movements for artificial respiration, or may be douched alternately with hot and cold water to stimulate respiratory activity. Oxygen may be given. Such manipulations must be given in a very warm room, in order to prevent chilling.

Stimulating manipulations for the heart centers are often required. Such attacks may be often repeated, and the mother or nurse should know the whereabouts of the physician at all times of day and night, so that in an emergency he may reach the child without delay.

In older children, with little or no fever and no great discomfort from the cough, it may not be advisable to insist upon their being confined to the bed all day. They should be protected from exposure, and be kept in warm, moist air until the acute stage has passed.

**Prognosis:** When recovery begins, it usually proceeds rapidly. If it is delayed, some further infection may be suspected. Occasionally recovery seems delayed only by a lack of strength; in such cases a change of climate may be advisable. In other cases, a few brisk stimulating treatments, so given as to affect the lower thoracic centers, may provide the appetite and the better nutrition essential to more rapid recovery.

### Chronic Bronchitis

This is not a common disease in children, though it may follow an acute bronchitis, or may result from the constant effects of exposure and the other etiological factors for the acute form. It is characterized by frequent and obstinate attacks of coughing, usually much worse at night and in the early morning. The paroxysms may be so severe as to suggest pertussis, with which it is often confused.

**Etiology:** Lesions of the interscapular region and upper ribs are invariably present. Several varying factors may cause chronic bronchitis, though none of them are common in childhood. Pulmonary tuberculosis; chronic interstitial pneumonia; chronic cardiac disease, especially if the mitral valve is affected; deformities of the chest, such as a rickety chest or Pott's disease; repeated attacks of acute bronchitis, and the persistence of exposure to cold, damp, windy weather,—these are the more usual causes of the disease.

**Diagnosis** is usually easy. The cough is persistent, paroxysmal, often with an inspiratory whoop, like that in pertussis; it is very severe in the early morning and during the night; not very marked, as a rule, during the daytime. There is no fever; very little dyspnea; very slight loss of weight,—not more than the exertion might explain; and the cough diminishes in warm weather, only to return when chilly days return. It may be that only the course of events can make clear the diagnosis between chronic bronchitis and whooping-cough, in border-line cases.

**Treatment** is very satisfactory in osteopathic practice. Always the lesions mentioned are found, and the correction of these brings return to normal conditions, not usually speedily, but improvement begins promptly and progresses steadily. Correction of any unhygienic conditions present is essential. The diet should be looked after with care, and excesses of sweets immediately and permanently forbidden. Change of climate is often very helpful. Mountains are usually better than the seashore, though almost any change seems helpful.

## CHAPTER XXXIII

### THE PNEUMONIAS

The various types of pneumonia may be logically considered in this section, although all are infectious in nature, and the croupous form is distinctly one of the infectious diseases. Yet, on account of the predominance of the respiratory symptoms, the direct relation between bronchial and pulmonary infections, and the fact that the symptoms and the physical indications so greatly resemble one another in all pneumonias, without regard to the nature of the infectious agent, their general discussion may very profitably be associated.

#### General Etiology of the Pneumonias

**Lesions:** The innervation of the blood vessels of the lungs must be considered, in determining the etiological factors of the pneumonias. The bronchial arteries and veins receive vaso-motor nerves from the second to the fifth spinal segments. The pulmonary arteries and veins have few or no vasomotor nerve endings, and this circulation varies chiefly according to variations in the systemic blood pressure. The non-striated muscle fibers of the bronchial tubes are innervated by the vagus, and undue stimulation of the vagus center may result in constriction of the lumen of the bronchial tubes to such an extent that aeration of the alveoli is seriously impeded.

It is evident that lesions of the upper thoracic vertebrae, or of the upper ribs, may seriously interfere with the normal circulation through the bronchial vessels, and that the nutrition of the lungs may thus be impeded. Lesions of the cervical vertebrae may either increase or diminish the functional activity of the vagal nerves, and this may result in either spasmodic contraction of the bronchial muscles, as in asthma; or an undue relaxation of these muscles, with resulting exposure of the alveoli to dust, bacteria, or cold air.

Experiments upon animals and clinical experience indicate the extreme importance of these lesions in lowering resistance to pulmonary infections of all kinds.

Resistance to infection in general results from lesions in the lower thoracic region and the lower ribs, as well as from the effects of all conditions which lower the general health, or which cause any form of toxemia. In animals, any lesion of the spinal column experimentally produced leads to diminished resistance, and, in adverse climates, results in pneumonia and usually death. Only in very mild climates can the tendency to pneumonia be avoided in lesioned animals.

These factors compel the view that any lesion may predispose to the pneumonia, and that any condition which depletes the vitality of a child causes diminished resistance to the pneumonias, as well as to digestive disorders.

**Age** is important. During the first two years of life, the bronchopneumonias are by far more common, and much more often fatal, than are the various types of croupous pneumonia. After two years, the croupous types are increasingly more common while the bronchopneumonias are less often found.

**Bacteria** are always present. Some one of the various types of pneumococcus is present in croupous pneumonia. Mixed infections are the rule in bronchopneumonia; the staphylococcus aureus, streptococcus, and bacillus influenzae are the more common bacteria associated with the pneumococcus. In bronchopneumonia following or associated with acute infectious diseases, the specific organisms of such diseases are present, usually associated with staphylococcus or streptococcus. The pneumococcus is not commonly found in typical cases of pneumonia following the acute infections.

**Climate** plays a part in etiology. Cases are more frequent in early spring and late winter, but are fairly common during all cold weather.

Hygienic conditions are important; children in institutions, or who live in unclean, poorly ventilated, damp, dark, homes are much more often affected than children who have fresh air and sunshine abundantly.

Two chief classes of pneumonia are recognized, each of which includes several types.

## BRONCHOPNEUMONIA

(Catarrhal Pneumonia; Lobular Pneumonia.)

This is one of the most fatal of the diseases of childhood, especially during the first two years of life. Bronchopneumonia is a catarrhal inflammation of the finer bronchial tubes and the alveoli; it is characterized by symptoms of acute pulmonary disease. It differs from lobar pneumonia in affecting many lobules in several regions, in producing muco-purulent exudate, and, in children, in the greater severity of the symptoms. Lobar pneumonia affects a lobe of the lung in mass; is not a serious disease in early childhood, and produces a fibrinous exudate which fills the alveoli.

### Types

The disease is rarely primary, and is then usually due to pneumococcus infection. Traumatic injury to the lung, or aspiration of foreign material, may produce a primary bronchopneumonia, in



which any of the pyogenic bacteria may be found, usually two or more are found associated; this condition is often followed by pulmonary abscess.

**Secondary bronchopneumonia** is much more common. It follows bronchitis of the ordinary type, or any of the acute infectious diseases; infectious diarrhea, measles, pertussis, diphtheria and typhoid fever are fairly common infections with which bronchopneumonia may be associated.

**Tubercular bronchopneumonia** is not uncommon. Chronic bronchopneumonia may result from delayed resolution, or the condition may be very slow and of chronic type from the beginning.

**Friedlander's pneumonia** is rare in this country. The bacillus capsulatus is the etiological factor, with the predisposing conditions already mentioned. The bronchi and alveoli are filled with an exudate in which leucocytes, a few erythrocytes, and great numbers of the bacillus capsulatus are found. The areas affected are larger than in ordinary bronchopneumonia, and may be limited to one lobe. There are successive crises or pseudocrises, and exacerbations follow apparent remissions. The disease resembles a very atypical bronchopneumonia or an atypical lobar pneumonia. If sputum can be secured and examined, the diagnosis is easily made upon the capsulated bacilli in great numbers. Otherwise the diagnosis is hardly to be made at all.

**Terminal bronchopneumonia** is of little clinical significance. It may occur just before death from any infectious disease, streptococcus in rather short chains are usually found abundantly at autopsy. A sudden rise in temperature with rapid pulse and still more rapid respiration during the last few hours of life, are the only symptoms. No treatment is possible, and it often is unrecognized until autopsy.

**Primary pneumococcus bronchopneumonia** is not common. It seems to be due to a pneumococcus infection which, for some unknown reason, affects the finer bronchial tubes in many areas rather than the alveoli in one large area. The course of the disease resembles that of lobar pneumonia, except that many small areas of both lungs are involved,—rarely, one lobe or one lung. It is rather less serious than secondary bronchopneumonia.

**Influenza bronchopneumonia** is common. The bacillus of influenza is often one of those present in a mixed infection, and it is occasionally the sole pathogenic organism found, especially during epidemics of influenza. This form of bronchopneumonia is characterized by the influenzal type of onset, and by the peculiar manner in which the small areas of consolidation follow one another. Resolution occurs in one area, and another area begins to show rales and

then consolidation; resolution occurs thus, and another area is involved, and so on. As the disease goes on, there are more and more areas involved, but recovery becomes progressively more rapid and the severity less marked, until finally no new areas are involved at all.

The sputum is especially abundant in the influenzal types, and is occasionally extremely offensive.

### Pathology

The tissue changes explain many of the symptoms and the physical findings. The lesions characteristic of the primary disease are, of course, present in patients with secondary bronchopneumonia.

The lesion typical of bronchopneumonia is an inflammation of the walls of the bronchial tubes and the alveoli. The small bronchi and the connective tissues around them and the alveoli show round celled infiltration, and the walls of the bronchi and the bronchioles are grayish, thickened, edematous, and their lumina are filled with an exudate composed of mucus, leucocytes, a few erythrocytes, and occasionally some fibrin, desquamated epithelium, endothelial cells, and lymphocytes.

These small areas of consolidation are scattered through the lung substance. Emphysematous alveoli are scattered between the consolidated areas. Quite large consolidations may be formed, and these may cause difficulty in diagnosis between lobar and bronchopneumonia.

These consolidated areas are rather more common in the lower lobes and the posterior portions of the lungs; the emphysematous areas are more abundant in the anterior areas. These consolidated areas undergo resolution and absorption within variable lengths of time; usually one or two weeks for each area. In influenzal bronchopneumonia, the succession of consolidations, resolutions and absorptions provides the characteristic physical findings in that type of disease.

Partial resolution may occur (or resolution may fail to occur at all. Such areas may be abundant, in which case death is inevitable, or, they may be scanty. Tubercular infection of such unresolved areas is common; lacking infection, a chronic interstitial pneumonia usually results. Rarely, pyogenic infection causes abscesses or gangrene may occur. Death is usual in these cases.

The pleurae are usually involved in the inflammatory process, and adhesions may result.

**Acute Red Bronchopneumonia (Acute Congestive Pneumonia):** If death occurs within the first two days, the lungs show acute congestion. The pleurae are very red, and occasional hemorrhagic areas can be seen. Both lungs show their lower lobes very dark red and heavy. No consolidation is visible to the naked eye, and the entire lung can be inflated. On section, pus and blood flow from the cut surface. On microscopic examination, the alveoli are seen to be involved in the inflammatory process, and the character of the exudate can be recognized.

Mottled, red and gray bronchopneumonia is the condition found in the lungs during the second week and the fifth to the seventh day of the first week. (Fourth to fourteenth days). Consolidated areas are now recognizable. The surface of the lung is mottled, reddish and greyish, and it has a coarsely granular feel. The consolidation may occupy an entire lobe, or areas of almost normal lung or of emphysematous areas may intervene. On section, pus flows freely. The microscopic examination shows the typical consolidation, catarrhal exudate in bronchi and alveoli, and areas of beginning resolution. Fibrin may be found also, as in lobar pneumonia. Pleuritic adhesions are more abundant.

Gray bronchopneumonia is a persistent condition, and is found from the third to the seventh week. Pleuritic adhesions are more abundant and are firmer. Both lungs may seem to be almost entirely consolidated, especially in the lower lobes and the posterior surfaces. The lung is yellowish or greyish in color. Pus is abundant and rather thin and small abscesses may be found. Emphysematous areas are present. The bronchial lymph nodes are always enlarged. The air vesicles are filled with cells, leucocytes, pus, desquamated epithelium, endothelial cells, and the alveolar septa are usually much thickened. Complete resolution probably never occurs after this stage is reached, and recovery is almost or quite impossible.

### Symptoms

In all types of bronchopneumonia certain symptoms are almost invariable. Other symptoms vary according to the primary disease. When bronchopneumonia follows or accompanies the acute infectious diseases, these modify the onset very profoundly, and also modify the later course of the bronchopneumonia to some extent.

**Onset:** The onset is rarely sudden. Chill or convulsions are very unusual. The child which has seemed well on the road to recovery from some infection becomes restless, fretful, coughs somewhat, breathes very rapidly and is feverish. On examination, scattered areas through the lungs show rales, fine or medium, moist, and sometimes sonorous or sibilant.

When the bronchopneumonia occurs earlier in the disease, the onset may be overlooked altogether, though the rapid breathing should usually attract attention. During measles the onset of bronchopneumonia is usually well marked; in pertussis the onset is apt to be much more sluggish, and may escape attention altogether.

**Temperature.** Fever varies remarkably, and this seems in part due to the nature of the primary disease. The usual temperature curve begins with a fever rising gradually to 103° F. or more, and remaining near that point for a day or two; morning remissions then begin to be noted, and still the temperature returns to almost or quite the original point during the afternoon; this diminishes irregularly until the morning remission reaches normal, and there is little or no rise during the day.

In more serious cases, the temperature may reach 107° F., and the fever may be highest in the morning. In still more serious cases, especially in patients with depleted vitality, the temperature may not rise much above normal, and may be subnormal before death. The increasing temperature gives a more serious prognosis than a sudden and temporary rise to higher degree. Rarely the fever falls by crisis.

**Respiration** is always greatly increased, usually to 60 or more per minute, and occasionally to 120 or even more per minute. During inspiration the soft tissues of the chest recede, and the alae nasi dilate.

**Cough** is sometimes painful, and is usually distressing, but in very weakly babies it may not be serious. It disturbs sleep, often causes vomiting, and may be either paroxysmal or almost incessant. Mucus is coughed up only to be swallowed; it is always very difficult to prevent this in children, and impossible to secure expectoration in little babies. The mucus is often inspired into the lungs during the forced inspiration of the succeeding cough, and thus further infection is facilitated. If the cough diminishes greatly while the pulse, respiration and temperature remain serious there is grave danger of failure of respiration due to exhaustion of the respiratory center or to lack of the bronchial sensibility.

**The Sputum**, when it can be secured for examination, shows abundant mucus, pus cells, desquamated epithelium from the bronchi, and many eosinophiles. Blood cells are not usually abundant.

**The pulse** rate is always rapid, but is not so greatly increased as is the respiration. The pulse may reach 150 or even 200, per minute, thus making the ratio of pulse to respiration 1:3 or sometimes 1:2 instead of the 1:4 ratio which is normal, and which usually persists during ordinary fevers. The pulse is usually full and strong at first, but later becomes weaker, irregular, soft and compressible.

**Cyanosis** may be noted at any time during the disease; usually at the time of sudden atelectasis, which may be temporary, or when a new area of the lung becomes congested. It is always to be considered a serious symptom, even when only the fingertips are involved. It may precede death, but usually passes away within a short time.

When dyspnea and cyanosis are due to atelectasis the temperature usually remains steadfast or diminishes slightly; when congestion of a new area of the lung is the cause of cyanosis, the temperature rises and other symptoms increase in severity. The atelectasis is due to obstruction of the bronchial tubes by mucus or pus, or to loss of elasticity of the lungs; if the condition persists, death is apt to occur quickly.

**Digestive** disturbances are frequent, especially in babies. Diarrhea, with six or more stools per day, is frequent; the stools are greenish with unchanged bile, and contain undigested food and abundant mucus. The swallowing of the mucus derived from the lungs is responsible for much of the digestive disorder. Diarrhea may be the first symptom of the disease, or bronchopneumonia may follow diarrheas of any type. Vomiting is frequent, especially after paroxysms of coughing. Distension of the stomach and intestines with gas is a serious factor; the pressure increases the dyspnea, and may cause cyanosis or convulsions, especially in little babies. Anorexia is common, even when the dyspnea permits nursing or eating. The use of cough syrups or of drugs to lower the fever increases the seriousness of digestive symptoms.



**Prostration** is always serious, even when the lack of food is considered. Emaciation proceeds rapidly.

**Nervous symptoms** occur as the disease progresses. Rarely convulsions occur at the onset; this is not serious, but when there are convulsions later, especially with cyanosis and marked dyspnea, the prognosis becomes very serious. Restlessness is always marked; apathy and stupor may result from exhaustion. Delirium is less frequent. The eyes remain about half open all the time, without regard to sleep or wakefulness.

**The blood** shows a leucocytosis which appears early and is always pronounced, with 20,000 to 50,000, or, rarely, 100,000 leucocytes per cubic millimeter, of which eighty per cent or more are polymorphonuclear neutrophils. In bronchopneumonia with pertussis, a large proportion of small hyaline cells may be present. When the temperature falls, the leucocytosis diminishes rapidly, and the blood should show practically a normal count within a week after the temperature reaches normal. Weakly children may not produce leucocytosis, and in these the prognosis is very grave. Influenzal bronchopneumonia seems to cause less marked leucocytosis than other forms; leucopenia may be present in such cases, and the child usually recovers fairly well.

**The urine** is that of febrile states in general; it is scanty, dark, with high urates, low chlorides, a trace of albumen, a few casts and renal epithelium. A considerable amount of albumen indicates beginning renal involvement, and adds gravity to the prognosis.

Recovery is usually irregular, with frequent exacerbations of diminishing severity. About two or three weeks of illness may be expected. The temperature may fall by crisis, but lysis is more common. The cough becomes looser and then diminishes. Respiration becomes easier, deeper and slower. Appetite returns, sometimes becomes voracious, so that care must be taken to avoid overeating and relapse. Exposure to cold is a common cause of relapse, though extension of the infectious process occurs without recognizable exposure.

Protracted forms are more common in primary and the influenzal bronchopneumonia, and is the secondary type associated with pertussis and measles. After three weeks or so, during which the disease progresses as does the usual type, there is seen little or no evidences of recovery. The fever diminishes to 102°F. or so, but is continuous; the areas of consolidation increase in size. Exacerbations and remissions alternate. Wasting, anorexia, indigestion, annoying cough, these symptoms persist and increase. Bedsores are frequent; the skin becomes dry and harsh, and death usually results from exhaustion within two months. Rarely a very slow convalescence may occur, even in protracted forms of the disease. Very gradually the

cough abates, appetite returns, the child begins to show interest in his surroundings, and after several months he may seem almost well. Usually the return to robust health is greatly prolonged; indeed some children never do seem so strong after an attack as they were before. This is especially the case when great amounts of drugs have been employed.

### Physical Signs

It is chiefly upon the findings secured by physical examination that the diagnosis must be made.

Consolidation may be absent. Congestion of the lung causes diminished breath sounds, with occasionally slight dullness or slightly diminished resonance. Vocal fremitus is not usually altered. Congestion, edema and hypersecretion cause rales, which vary according to the size of the bronchial tubes affected, the distance of the affected tubes from the chest wall, and the character of the pathological changes present; coarse, or fine, sonorous rales, fine moist rales, harsh crackling sounds, all may be present at different times. The presence of fine, moist rales in many different small areas is practically pathognomonic of bronchopneumonia. Throughout the entire course of the disease no further physical signs than these may be found.

Partial consolidations may occur, and these vary the sounds. Slight dullness, or no dullness may be found; usually in several widely separated areas. Vocal fremitus is not usually altered. Over areas of partial consolidation the rales are sharper, higher pitched, more metallic in character. The breath sounds are feeble in such areas, and approach bronchial character more and more definitely as the consolidation becomes more and more pronounced. Resonance is exaggerated. Such an area is surrounded by abundant moist, fine rales.

Complete consolidation gives some dullness, some increase in vocal fremitus, some friction sounds, but these are much less marked than in lobar pneumonia, because in bronchopneumonia the consolidation involves only superficial and shallow parts of the lung, while in lobar pneumonia the entire lobe is usually affected. Bronchial breathing is marked over the consolidated areas, while rales of varying types are heard throughout the lung areas. The areas of consolidation are not sharply outlined, as in lobar pneumonia, because the entire process of pathological events is indefinite in bronchopneumonia.

### Differential Diagnosis

When any child, whether he is ill or not, shows rise of temperature, with rapid respiration, dyspnea or cough, or all three, pneumonia should be suspected. Prostration, leucocytosis, pulmonary rales, make the diagnosis of some form of pneumonia almost certain.

**Acute bronchitis** may be mistaken for pneumonia in the beginning of the disease. However, in bronchitis the rales are always coarse and of the bronchial type; dyspnea is rarely marked; cough is looser; pulse is not very rapid; temperature is not so high, prostration is less marked, and the general condition of the child is less serious. Bronchitis may precede bronchopneumonia, and it is not possible to determine, in any case of bronchitis, whether it will or will not be followed by bronchopneumonia.

**Lobar pneumonia** may present great difficulty in diagnosis. In typical cases, the lobar areas involved in solidification, the more regularly sustained temperature curve, the crepitant rales, broncophony, and bronchial breathing, all in the affected area alone, indicate lobar pneumonia. Cyanosis and severe dyspnea are rare. No other disease is apt to precede lobar pneumonia. On the other hand, in bronchopneumonia solidification rarely occurs, and, when it does occur, the areas are scattered, small, not deeply situated, and usually both lungs are involved. The temperature is irregular and variable; prostration is more serious; cyanosis and very severe dyspnea are common. The X-ray examination gives definite information in most cases. However, in atypical cases of either disease, diagnosis may be impossible.

**Tubercular bronchopneumonia** presents great difficulty in diagnosis. If the sputum can be obtained, by a pharyngeal swab, the bacilli of tuberculosis may occasionally be found in the tubercular form. The sputum which has been swallowed may occasionally be vomited immediately; sometimes the tubercle bacilli are found in this material.

### Treatment of Bronchopneumonia

**Prophylaxis** is important. By immediate and watchful care of children with bronchitis, many cases of bronchopneumonia are avoided. It is important to note that children well cared for may occasionally contract bronchitis, but that few of these have bronchopneumonia, whereas, of neglected cases of bronchitis, a very considerable percentage develop bronchopneumonia, and many die from that disease.

Measles and pertussis are, too often, considered mild diseases, and children with these diseases may fail to receive proper care. In these diseases, pulmonary symptoms are always present and are dangerous. In any acute infectious disease, the danger of pulmonary infection should be kept in mind, and the child protected from exposure until convalescence is well on the way.

**Lesions** as found must be corrected, with care to avoid irritation to the lung centers, especially. The cervical muscles are contracted; these diminish the size of the thoracic inlet and must be relaxed.

The interseapular muscles are contracted, and this area of the spinal column has diminished flexibility, in bronchopneumonia; these conditions must be relieved, the ribs carefully raised, and vomiting, diarrhea and constipation treated according to the methods given under those headings. Inhibition of the lower splanchnic centers lowers fever and often diminishes dyspnea and cough. Sharp raising of the ribs and stimulating treatment affecting the heart centers are useful in collapse, with the other methods given later. Protracted cases are not to be expected with early and vigorous treatment, but when they do occur, the treatment as given above should be vigorously followed, and, in addition, stimulation of the splanchnic centers should be given, to increase appetite and facilitate digestion.

**Hygiene:** As in other acute diseases, the child should be isolated from other children. If a child has bronchopneumonia following measles, it seems that other children with pertussis, bronchitis, or measles may contract bronchopneumonia from him; under ordinary circumstances broncho-pneumonia does not seem to be contagious.

Children too large to be held in the arms must be kept in bed, but must not be permitted to lie in one position; they may lie quietly when sleeping for two hours or so, but they should be gently moved to one side or the other, even during sleep, in order that hypostatic pneumonia may not occur. During wakefulness, the position should be changed once or twice every hour.

Little babies may be held in the arms with advantage, and children not too heavy may be held in the arms occasionally. In this way the position is often changed, and gravity helps in diminishing the blood in the lungs.

**Diet:** During the fever, no food should be given, other than very greatly diluted fruit juices. This diluted grape juice, orange juice, blackberry juice, or pineapple juice diminishes the tendency to acidosis, provides a very small amount of nourishment, and provides also the vitamins required by the body at all times. Any other food materials increase the fever, encourage acidosis and toxemia and delay recovery.

If symptoms of collapse occur, a small amount of very thin gruel may be given, cautiously. A child one year old may have two or three ounces of very thin gruel, without milk or cream or sugar. This is a rare emergency.

If the child cannot take enough water to prevent desiccation, the Murphy drip may be used to complete the necessary water intake. Colon flushing may be employed in occasional cases, but the Murphy drip has the commendation of a large number of osteopathic practitioners whose success in dealing with these children is recognized. Hypodermoclysis may be necessary in very severe cases.



Cold air seems to have an advantage over warm air, though the warm air may be equally pure. Children in bed may have the temperature kept at 50° F. constantly. The windows should be wide open, with hangings to protect from draft if the wind is too strong. The child should wear a warm wrapper, warm stockings, and have enough hot water bottles to keep the body warm all the time, but not so warm as to cause sweating. Children kept in a cold room sleep better, breathe better, cough less, and make better recovery than those kept in warm rooms, even though the air may not be contaminated by the heating system.

Warm air is essential to certain feeble children and little babies. The air should not be warmer than is necessary, and should be as fresh and as pure as it can be made. When dyspnea and cyanosis are marked, small amounts of oxygen added to the inspired air may give great and immediate relief.

**Coughing** is often relieved by treatments affecting the interseapular centers and the cervical tissues. Inhalations of steam are very useful. Aromatic oils may be added to the boiling water, if desirable, but it is the steam itself which gives the relief. Dyspnea may be relieved in the same way. Counterirritation is very useful; a weak mustard bath, or the application of a thin mustard plaster, until the skin is slightly reddened, is useful in the early stages especially.

**Fever** may be best relieved by inhibition of the lower splanchnic centers, and by sponge baths of tepid or warm water. A temperature of 101° F. to 103° F. seems to provide best for overcoming these infections, and this temperature is not especially harmful to a resting child.

If the temperature exceeds 104° F. antipyretic measures should be used, by warm or tepid sponging, a cold pack, ice bag to the chest, or cold compresses. In hyperpyrexia with cyanosis, chilly skin, rapid and feeble breathing, stimulating treatments to the heart, raising the ribs, and a warm mustard bath should be given. Oxygen should be mixed with atmospheric air for breathing.

**Collapse** should be met by stimulating treatment affecting the cardiac centers, a hot mustard bath and application of heat to the feet and abdomen. Oxygen should be mixed with the air breathed by the child. A small amount of thin hot gruel may be given.

Protracted cases require protracted treatment. Stimulating treatments are especially indicated. Feeding must be very judiciously controlled, so that the appetite may be increased and nutritious food provided which is easy of digestion. Change of climate, especially from a damp chilly to a warm dry climate, is often the beginning of rapid convalescence.

After recovery has begun, care is necessary to avoid relapse. The food must be nutritious, appetizing and digestible. Abundance of

fresh air is required. Exercise must be graded to meet returning strength.

Weekly examinations should be made and lesions corrected as found.

### Prognosis

Bronchopneumonia is always a serious disease. Influenzal bronchopneumonia has the most cheerful prognosis; about ninety per cent may be expected to recover. About half of the cases of primary bronchopneumonia recover. About one-third of the cases following acute bronchitis and measles recover, while bronchopneumonia complicating diphtheria, dysentery, erysipelas and smallpox usually results in death, though a few cases do recover. During the first year, all forms of bronchopneumonia are expected to terminate in death; after the third year, recovery may be hoped for.

Continued high temperature, above 105° F., very irregular and varying temperatures, and low temperatures, 99.5° F. or lower, all add gravity to the prognosis.

Vomiting, diarrhea and tympanites are extremely serious symptoms.

Convulsions early in the disease are not serious, but convulsions occurring after the onset, especially when associated with cyanosis, add greatly to the gravity of the prognosis.

Protracted cases are always serious, though hope is not lost at any time, even in greatly prolonged cases; at any time nutrition may become better and recovery occur, though always very slowly.

## LOBAR PNEUMONIA

(Fibrinous Pneumonia; Croupous Pneumonia; Acute Pneumonitis)

Lobar pneumonia is an inflammatory disease of the lungs, usually due to one of the pneumococci, and characterized by consolidation of one or more lobes of the lung by blood and fibrin in the alveoli.

### Etiology

The general etiology has already been discussed on page 230.

The specific organisms are abundantly present at all times. Several theories have been advanced to account for the relative paucity of the cases of this disease, while the infectious agent is so abundantly prevalent.

The first theory supposes that certain strains of the pneumococcus are especially virulent. Were this true, pneumonia should be more contagious than it is. Rosenow's theory is that members of the pneumococcus-streptococcus group may, in any individual's tonsils, or other areas of the pharyngeal or buccal cavities, meet conditions which increase their virulence for certain tissues of that especial individual. Thus, the organisms might at any time acquire increased virulence and selective tissue affinity for the lungs, whence pneumonia would probably occur.

The second theory supposes that any individual's resistance to infection might be lowered at any time, and thus permit the invasion of the body by

bacteria. The increased danger of pneumonia in alcoholics is in harmony with this theory; and it has been shown that animals which have been suddenly chilled, or which suffer from bony lesions are more susceptible to pneumonia than normal animals. On the other hand, pneumonia attacks so many apparently healthy individuals that this theory seems unsatisfactory.

The third theory is that for some reason the resistance of the lungs is lowered. This is supported by the fact that interseapular and cervical lesions are practically invariable in pneumonic patients, and in patients subject to pulmonary infections in general. It is also well known that an injury to the chest may be followed by pneumonia, and that inhalation of irritating dust or gases, or of very cold or very dry air, predisposes to pneumonia.

The disease occurs at all ages. The specific lesions have been found in newly born babies, and it is the disease which very often terminates life in very old age. Even in babies, males are somewhat more often affected. It is rather common after the first year of life, but is less common after the sixth year. It is not a very serious disease of early childhood, and recovery is to be expected within two weeks or so.

### Pathology

The tissue changes are typical. First a fibrinous exudate, then blood fills up the alveoli, without any inflammation of the bronchioles. First a stage of congestion is produced, and this is associated with exudate. This exudate coagulates, and thus a solid mass is formed. This state is called "red hepatization". By invasion of the affected area with leucocytes, the digestion of the fibrin by means of the fibrinolytic ferment of the blood, and the destruction of the hemoglobin, this solid area becomes grayish in color, and the condition is then called "gray hepatization". With more complete digestion, the coagulum becomes liquid, and it is in part slowly absorbed by the lymphatics, the capillaries of the lungs, and the phagocytes; and a part is coughed up. This is the stage of resolution, and the stage of absorption. In ordinary cases, this absorption leaves the lungs in normal condition, and recovery is complete. At autopsy, all stages may be seen in a single lung.

The consolidation affects one lobe, or part of a lobe, or several lobes. The order of frequency of involvement is as follows: First, the left lower lobe; second, the right upper lobe; third, the left upper lobe; fourth, the right lower lobe; and this relation is given by nearly all authors. The disease begins at the periphery, and probably the central areas are never primarily affected.

### Symptoms

**Onset:** After a few hours of malaise, which usually includes vomiting, anorexia and chilliness, rigor, or, in babies, convulsions, the temperature rises rather quickly to 103° F. or more. The child seems very sick. Children able to talk complain of headache, weakness, and, occasionally, of sharp pain in the side or in the abdomen. The pain may resemble that of appendicitis. Babies often show more pronounced digestive symptoms, and the vomiting may be rather severe.

**Fever:** The temperature of the first day, 103° F. or 104° F., usually persists, with one or two degrees diminution each morning, until the crisis. The temperature may rise to 105° F. or more on the second day. On the fourth to the seventh day, in typical cases, the temperature drops suddenly to normal or subnormal, and thereafter the fluctuations do not vary greatly from the normal, and very rarely rise above 99° F.

Occasionally the crisis is so pronounced that collapse occurs, and this may be fatal. A sudden dropping of the temperature may occur, to be followed almost at once by a rise to almost or quite the original point; these pseudo-crises may be several times repeated. Atypical fluctuations of temperature may cloud the diagnosis; these are rather common in babies. Weakly babies may show no recognizable fever; these cases are much more serious. Babies may show termination of the fever by lysis instead of crisis.

After the crisis, a rise of temperature much above normal suggests several complications,—the involvement of a new area of the lung; development of pleurisy, usually purulent; otitis media; peritonitis; meningitis; or endocarditis or pericarditis.

In very severe or fatal cases, the temperature may remain very high, even to 109° F. Even with these high temperatures, crisis may terminate the fever, and recovery occur, provided the high temperature does not remain long enough to cause destruction of protoplasm in any vital tissue.

**Pain** varies considerably. It is less in children than in adults. Headache often accompanies the fever. Pain in the side of the chest may be noted in older children. Younger children often complain of abdominal pain, and this may simulate appendicitis. Coughing or even breathing may be painful, as in pleurisy. General muscular aching and backache may be associated with the fever. A general malaise and restlessness is more common than any well-localized pain, in children.

**Respiration** is always rapid, not labored, often spasmodic; the pause often follows inspiration rather than expiration, as is normal, and expiration is often forced and accompanied by a moan, groan, or a sobbing sound; the expiratory moan is rather distinctive. The greater the rapidity of the respiration, the greater, usually, is the amount of lung tissue affected. The respiratory-pulse ratio is affected, being about 2:1.

**Cough** may not be noted until the third day; rarely it fails to appear. It is not often painful or difficult or annoying, but may cause considerable distress. After resolution begins, the cough is loose and productive.

**Sputum:** Babies and younger children swallow the sputum, or it may be aspirated into the lungs. They may vomit sputum which has been swallowed. Older children may be taught to expectorate. The sputum resembles that of adults, being rusty, purulent, and with abundant pneumococci in the cells and in the intercellular substance. Alveolar epithelium and large phagocytic cells, filled with remnants of erythrocytes are abundant, especially after resolution begins.



**Prostration** is marked throughout the disease. It is easy to keep the children in bed from the first day and until strength returns after the crises. Rarely ambulatory cases are found; these do not make as rapid recoveries, as a rule.

**The pulse** gives no important findings. It is about 120 to 150 at first, and is full and strong. It may reach 180 in babies, without harm. With the progress of the disease, it becomes weaker and more irregular. With beginning cardiac weakness, it becomes thin and running in character and variably irregular. The pulse rate is not important, so long as cardiac efficiency is maintained.

**Gastro-intestinal** symptoms are more common in little babies than in run-about or older children. Vomiting and diarrhea are very common during the onset of pneumonia in babies, and they may not be relieved when the temperature rises, as is the case with older children. Anorexia, coated tongue and occasional constipation or diarrhea may continue during the fever. Drugs employed for the relief of the cough and for lowering the fever may cause persistent diarrhea, vomiting, or constipation. When tympanites is marked, the difficulty in respiration may be greatly increased. Tympanites may be the first symptoms of cardiac inefficiency, and it is always rather a serious symptom.

**The skin** is often flushed, sometimes one side of the face is very red, while the other side is quite pale. This relation has no significance. Cyanosis is not common, and it may indicate beginning cardiac or respiratory failure. Herpes labialis is common, especially in children who do not have good nursing.

**Urinary** changes are those characteristic of fever. The urine is scanty, dark in color, with high urates and low chlorides. Acetone is often increased; diacetic acid is rare. Renal involvement is less common in children than in adults. An increase of chlorides in the urine often precedes the crisis by several hours, and this may help in the prognosis.

**Blood** changes are definite. Leucocytosis is usually about 30,000 to 40,000, but may reach 100,000. Weakly babies may not show leucocytosis, and these are usually fatal cases. If a healthy child becomes sick, and shows no leucocytosis, pneumonia is strongly contraindicated. Blood cultures may show the pneumococcus, but this is less common than in adults.

**Nervous** symptoms vary. Convulsions in babies have already been mentioned as occurring occasionally during the onset. Delirium may be present during the height of the fever, especially during the night. Convulsions occurring later during pneumonia are of rather serious import. In most cases, the restlessness, insomnia, apathy, delirium, seem to depend upon the fever and the toxemia.

Abnormal pupillary reactions, dilatation or contraction, or inequality, opisthotonus, retracted abdomen, may cause marked resemblance to meningitis. Lumbar puncture may show the presence of pneumococcus in the spinal fluid, though usually only an increase in the cells and the globulin is found.

### Atypical Cases

**Abortive Pneumonia** begins as in atypical cases, and may seem to be as severe during the onset as a typical case; or the initial symptoms may even be more severe than is usual in typical cases. The examination of the lungs shows the first stage of pneumonia, that of congestion, and the X-ray examination may verify this. Within one day or two days the fever diminishes by crisis or lysis, the symptoms clear up rapidly and recovery seems complete within a few days. These cases are frequently reported in osteopathic practice. An examination of the sputum, if this can be secured, shows the high fibrin content, rusty streaks, and the large phagocytic cells filled with fragments of erythrocytes, with some pus, alveolar epithelium and abundant pneumococci, which are characteristic of pneumonia of the ordinary type during recovery.

**Short Pneumonia** resembles the typical case in every way except that the symptoms are less pronounced, the crisis appears on the third day or about that, and recovery is complete within a week or ten days. This type also is often reported in osteopathic practice.

**Prolonged Pneumonia** (Creeping Pneumonia; Wandering Pneumonia) is usually due to the successive involvement of several lobes in succession; sometimes both lungs are finally affected. When the temperature is prolonged while the physical signs are limited to one lung, complications should be suspected. These cases are very serious, and may be fatal. Death occurs from respiratory or cardiac failure, or from exhaustion.

**Hyperacute Pneumonia** (Fulminating Pneumonia). This type does not occur in babies. The onset is very sharp, often with convulsions. Prostration is speedy and pronounced. Acidosis is profound; the respiration is deep and prolonged, as in air-hunger. Cough may be slight or absent, and the symptoms do not suggest pulmonary disease. Delirium or deep coma may alternate, or either be present alone. Death occurs within two days. The diagnosis is usually impossible unless an autopsy is performed, when the typical pneumonia lesions are found, with no structural explanation of the extreme severity of the attack.

**Cerebral Pneumonia** is a type characterized by an unusual importance of cerebral symptoms. The old idea that pneumonia of the apices was more often associated with cerebral symptoms seems to have no sound basis in fact. In some cases toxemia is the cause of the cerebral symptoms; in others a true meningitis due to pneumonia infection is present.

Convulsions are common during the onset; headache is very severe; ocular symptoms; rigidity, and opisthotonus; coma, or delirium, frequent and persistent vomiting, sometimes projectile; and other symptoms suggesting meningitis may veil the diagnosis. If the physical symptoms are rather late, a mistaken diagnosis is easily made.

**Gastric Pneumonia** is a type in which the digestive symptoms are pronounced. Vomiting may persist; the tongue is deeply coated; diarrhea is severe, and an error in diagnosis is easy unless this type is kept in mind.

**Appendicular Pneumonia** is characterized by severe pain in the region of the appendix; the pneumonia is usually in the lower lobe of the right lung.

**Pleuropneumonia:** In all cases of lobar pneumonia the pleural membranes are involved to some extent. The thoracic pain is due to the pleural involve-

ment. When the pleurae are inflamed to an unusual degree, thoracic pain is much more severe, and the constitutional symptoms are more marked. The physical signs are modified; friction sounds infrequent, and the presence of the pleural exudate diminishes the rales, and the sounds of bronchial breathing; and increases the areas of dullness. Usually the pleuritic involvement does not cause more than a plastic exudate, which clears up slowly during recovery, but small purulent foci may be formed, or a considerable empyema may result from the infection. Great masses of yellowish green purulent exudate may be found at autopsy. When the left pleurae are affected, pericarditis is common. Meningitis and peritonitis are not rare complications. Babies usually die; older children may recover with proper care, after a long illness and tedious convalescence.

**Hypostatic Pneumonia** is not often diagnosed during life. The lungs are filled with blood, due to gravity in a weak individual. Weakly and premature babies may die from this cause, though this is probably unusual. The pleurae remain normal. Not all alveoli are filled, and intervening, apparently normal or emphysematous vesicles are present. Only the superficial areas are involved, as a rule. The condition may be confused with atelectasis, unless microscopical examination is made.

### Physical Signs

During the stage of congestion, less air enters the affected lobe. The respiratory murmur is feeble and of rather higher pitch than normal. In the uninfected lobes, the respiratory sounds are intensified. This may lead to a suspicion of bronchial breathing, and a bronchopneumonia may be supposed to exist in what is really the normal lung. Fine crepitant and subcrepitant rales are abundant in the affected lobe.

X-ray plates show that the congestion and consolidation begin at the surface of the lung, and extend toward the hilus. When consolidation reaches the hilus bronchial breathing may be heard.

With progressing consolidation, usually about the fourth day, the breath sounds grow fainter and fainter, until no air enters the vesicles at all. Dullness is apparent over the affected lobe; vocal fremitus is exaggerated and bronchial breathing is evident; a tympanitic note may be found. The healthy lobe gives exaggerated resonance. Pleuritic frictions may be heard over the affected lobe.

During resolution moist rales are abundant. The dullness diminishes, as do other signs of consolidation. Bronchial breathing becomes broncho-vesicular, then vesicular, then the breath sounds become normal, usually about three weeks after the onset of the pneumonia.

Variations in the time of appearance of the different stages are occasionally found, usually this is due to delayed progress of the disease. Central pneumonia does not occur, but when the consolidated areas remain superficial, the characteristic signs of consolidation may not appear.

### Treatment

Careful examination invariably shows contracted muscles and diminished flexibility in the interscapular region, and around the thoracic inlet. These tissues must be treated two or three times each day, during the first few days, if this is possible. Lesions of the lower thoracic region diminish resistance to infections generally, and these must be corrected as soon as this can be done without undue irritation to the nerve centers affected. Raising the ribs, especially the upper ribs, diminishes the distress, if there is any, in breathing, and relieves the cough if this is troublesome. Inhibition of the splanchnic centers lowers the fever, if this tends to exceed 102° F., and relieves restlessness for several hours after the treatment is given. The first and second ribs and the clavicle usually require attention. The hyoid should be examined, and any abnormal muscular contractions which affect its position should be relieved. The cervical lesions act upon the vagus centers, and this may affect the heart adversely; such lesions must be corrected. The condition of the left ribs, the second to the fifth, should be noted, and such corrections as are indicated should be made; this modifies the heart action.

The pulmonary inflammation causes abnormal contractions of the intercostal muscles; these must be kept as nearly normal as can be, by raising the ribs generally.

The cardiac distress may also be relieved by cold compresses, cloths wet in water at about 60° F. should be placed over the thorax, and covered with woolen cloths; the compress should be left on for ten to thirty minutes.

**Diet:** During the fever no food is to be given, but water and fruit juices, greatly diluted, are to be given freely. When the temperature diminishes below 100° F. a small amount of thin gruel may be given, especially if the child seems very weak. Loss of weight is prevented by the abundant water. If the child refuses to drink the water, or if he cannot take enough water to prevent desiccation, for any reason, the Murphy drip provides sufficient water intake.

If symptoms of collapse occur, a few spoonfuls of thin gruel may be given; this rarely occurs, and most often follows the crisis. The amount of food varies with the age of the child; for a baby a year old, about two ounces of thin gruel is all that should be given.

Enemas should be used freely. The Murphy drip should be employed in every case in which toxemia seems marked, and in those cases in which it is difficult to provide a sufficient water-intake to prevent loss of weight.

If the fever exceeds 103° F., bathing should be begun. Sponging with tepid water reduces fever in most cases. If this is not enough the child should be placed in a tub of water at about 97° F., and left



in the tub as the water cools, or is cooled, to about 80° F. The child should not exert himself, but should be lifted very gently into the bath and into the bed again. An ice bag may be placed over the chest or over the interscapular region to reduce fever and to relieve pain. None of the methods which depend upon cold water or cold applications should be used with feeble children or little babies.

The cold air treatment is now being used extensively. The child is well wrapped and covered, and hot water bottles are provided in order to keep the body warm. The room is kept at about 50° F. or slightly warmer and drafts are avoided by means of screens and hangings. All windows are kept wide open, unless very violent winds are blowing; in that case the wind may be kept out. With the cold air breathed, cough and restlessness are largely avoided, and recovery is more rapid than when warm air, even though fresh and pure, is breathed.

Some children do not do so well with the cold air, and for these the room may be kept at higher temperature; the air must be kept pure and fresh and fairly moist.

Oxygen may be mixed with the inhaled air, in cases of apparently failing respiration and cardiac action. It is not usually required.

### Prognosis

In cases of ordinary lobar pneumonia, with early osteopathic treatment, all cases should recover within a week or ten days. If osteopathic treatment is postponed for a week all cases should recover, unless the delay has permitted complications to occur. Pleuropneumonia is more serious; yet these cases also may be expected to recover. Cerebral types are more serious; these should recover after two or three weeks, though they may be fatal. Fulminating cases are usually fatal before any treatment can be given. Hypostatic pneumonia requires only the treatment for the primary disease; its chief treatment is prophylactic. Children who are not permitted to lie in one position for too long a time do not suffer from hypostatic pneumonia.

### PLEUROPNEUMONIA

This term is applied to those cases of pneumonia in which a very considerable area of the pleura is involved. It must be remembered that a certain amount of pleura is inflamed in all cases of pneumonia, at least the pleural area over the pneumonic lung is inflamed. Bronchopneumonia is rather more often present in pleuropneumonia than is lobar pneumonia. The left lung is more often affected. The extent of the pleural involvement varies; always beginning with the pneumonic lung area, it may spread over the entire lung, and into the opposite pleural cavity.

The tissue changes are typical. Both visceral and parietal pleura are covered with a semi-purulent, fibrinous coating, thick, greenish or yellowish, and containing the usual purulent cells. The pneumococcus is by far the most common organism; other pyogenic bacteria may complicate. This coating may be remarkably abundant. Partial organization and the coagulation of the fibrin form many pockets, which are filled with pus or serum.

The pericardium is usually involved if the disease affects the left lung. The heart is not displaced, as in ordinary cases of pleurisy.

During recovery, this exudation may be partly absorbed, but large amounts of organized deposit remain, finally forming a thick, tough, heavy coating over the lung which cripples its function very materially throughout after life.

**The symptoms** are indefinite; usually there seems to be an unusually severe pneumonia. Friction sounds may be heard early in the disease, but these may not seem more pronounced than in ordinary pneumonia. Findings characteristic of consolidation, and of effusion are found, and these vary from day to day, according to the pathological processes.

Exploratory puncture may show some pus or some serous effusion or may bring nothing from the chest, according to the character of the area punctured by the needle,—thick fibrinous deposit, a serous pocket or a pus pocket. If pus is withdrawn, and, the thorax opened, masses of abundant fibrinous material are found.

**Diagnosis** is extremely difficult, and may be determined only at autopsy.

**Treatment** is that of the bronchopneumonia or severe lobar pneumonia which is present.

**Prognosis** is very serious. Death is to be expected; it may occur within a few days after the fever is first noted. In children of two years or more, empyema is most apt to follow the changes just mentioned. If recovery occurs, convalescence is very slow, and relapses are to be expected. Meningitis is often a complication; it is usually fatal in these cases. General septicemia is not unusual.

## CHRONIC INTERSTITIAL PNEUMONIA

(Chronic Bronchopneumonia; Bronchiectasis)

This is a chronic inflammation affecting chiefly the connective tissue of the lungs; the stroma, the alveolar septa, and the pleurae. It is usually associated with dilatation of the bronchi.

**Etiology.** The disease follows bronchitis, bronchopneumonia or pulmonary tuberculosis. Why it is that resolution occurs and recovery is complete in one child, while in another resolution is incom-

plete and recovery delayed, with development of chronic pneumonia, is not yet decided. The lack of a fibrinolytic ferment in the blood may be the reason, or it may be that the resistance of certain individuals is sufficient to maintain life during the infection, but not sufficient to overcome the invading organisms completely.

The bony lesions which diminish resistance to infection have already been mentioned in the discussion of the general etiology of the pneumonias.

**Pathology:** The tissue changes explain the symptoms. Usually a portion of one lobe, or several areas in different lobes, are affected. There are dense connective tissue adhesions between the visceral and the parietal pleurae. Irregularly arranged areas are present through the affected lobe, in which the lobules are bound together and penetrated by hard cords and knots of connective tissue, scar-like masses. Between these hardened masses emphysematous alveoli are found. In some areas the lung substance seems completely lost, and only a hard, fibrous, tumor-like mass is left, through which the bronchial tubes, often dilated and expanded, are seen to pass. Tubercular areas are usually present.

**Symptoms.** The history usually shows an attack of bronchopneumonia from which the child has not completely recovered. Rarely lobar pneumonia initiates the chronic form. The acute disease has subsided, but the cough, some thoracic pain, and shortness of breath have persisted. Dulness can be found on examination, with varying bronchial murmurs. Several successive attacks of bronchopneumonia, bronchitis and "bad colds" may be reported. When bronchiectasis is present, as it is very often, an abundant sputum, mucopurulent and sometimes fetid, is coughed up, and is either swallowed, aspirated, or expectorated. When it is swallowed, it may be vomited, and thus secured for examination.

The characteristic physical signs may be delayed for months. Retraction of the chest is most marked when the apices are involved. Dulness or flatness over the affected areas, with increased breath sounds and increased resonance over the normal areas, are present. The respiratory murmur is very feeble in the affected lobes. Friction sounds and rales are marked during an exacerbation of the pulmonary disease.

The heart is often drawn far to the affected side by the adhesions. Cardiac difficulties are frequent, and are due to pericardial involvement. The fingers may be clubbed, and chronic cyanosis present. Bronchiectasis is frequent, but cavities are very rarely found.

The X-ray plates should be studied for the presence of some foreign object, which might be responsible for the disease.

**Treatment** is of little avail, so far as recovery of the affected areas is concerned. Such treatment as has been outlined for pulmonary tuberculosis should be given; most of these cases either are tubercular or soon become so. Change of climate is often very help-

ful, especially from a chilly damp to a dry warm climate; or from a damp hot to a cooler dry climate.

**Prognosis** is always grave. Tubercular infection, death from an acute pneumonia or from some intercurrent disease, is to be expected. If these children recover, they are usually delicate the rest of their lives.



## CHAPTER XXXIV

### UNUSUAL OR UNRECOGNIZABLE PULMONARY DISEASES

#### Hypostatic Pneumonia

Prolonged passive congestion of the lungs may cause hypostatic pneumonia. The child with any debilitating condition, left lying in one position too long, suffers passive congestion of the dependent areas of the lungs, and thus from hypostatic pneumonia. Typhoid fever, bronchopneumonia or lobar pneumonia, severe diarrheas, marasmus, these are the diseases in which this disease is most apt to occur.

As the result of gravity, the weakened blood vessels become over-filled, when the child remains too long in the same position; the alveoli become filled with an exudate containing fibrin, desquamated epithelium, erythrocytes and leucocytes. The lung is red and firm when examined at autopsy. The pleura are not involved, and no evidences of infection are found.

Diagnosis is rarely made ante mortem. No dyspnea, cough, or fever result from the condition, and no symptoms arouse suspicion of the condition. The deficient aeration of the blood facilitates death from the primary disease.

Treatment is that of the primary disease, and the prophylactic habit of changing the position of any sick child occasionally.

#### Acute Pulmonary Emphysema

This condition is usually present, in some degree, in children with diseases of the lungs. In pneumonia, atelectasis, or in the presence of lung abscess or pleuritic adhesions, the emphysema may be compensatory. The emphysema which results from hard coughing, or from laryngeal obstruction is due to obstruction.

The vesicles are distended, but not seriously injured; rupture is absent or slight. Areas of emphysema are often associated with atelectatic areas, or with areas of consolidation due to any condition.

When the cause of the emphysema disappears, the elasticity of the alveoli and of the interstitial tissues leads to recovery of the injured lobules.

Rarely, the rupture of the alveolar walls permits the escape of air into the connective tissues; this condition is more common in chronic emphysema.

Symptoms are not definite, and the condition is rarely recognized ante mortem.

The treatment is that of the primary diseases; nothing further is necessary.

### Chronic Pulmonary Emphysema

This condition results from long-continued excessive intra-thoracic pressure. Any chronic dyspnea, such as is found in asthma, chronic pneumonia, pulmonary tuberculosis, chronic bronchitis, adenoids, or deformities of the chest, as in rickets or Pott's disease, is apt to cause chronic emphysema.

The alveoli are dilated, and often ruptured; the alveoli thus communicate with each other and sacules are formed; these vary in size from those so small as to be invisible to the naked eye, to those as large as a hen's egg. The diminished area for the aeration of the blood may thus become quite serious.

The capillaries of the affected area may be completely obliterated. The rupture of the alveolar walls permits the air to escape into the connective tissue spaces, as in interstitial emphysema; or to accumulate between the lobules of the lungs, as in interlobular emphysema; or to reach the subcutaneous tissues, most frequently around the apices, as in subcutaneous emphysema. In the latter condition the air may pass upward around the neck and face, and cause great deformity.

**Symptoms** are not definite. Resonance may be exaggerated; cardiac sounds may be diminished or even obliterated; the respiratory murmur may be diminished; but these symptoms might be due to the primary disease in any case. The chest assumes the barrel-shape if the condition persists; this is especially true in asthmatic cases.

Treatment is that of the primary disease. Nothing can be done for the emphysema, as such.

**Prognosis.** Emphysema adds to the seriousness of the primary disease, but in itself does not cause death. The pulmonary areas affected never recover from the chronic condition, but unless these areas are of considerable extent no trouble results after the primary condition is relieved.

### Acquired Atelectasis

The atelectasis of the Newly Born has already been discussed. Later in infancy, and during childhood atelectasis may be acquired. It is not a primary disease, but results from several abnormal states of the chest.

**Etiology.** Rachitis is the most common cause; the general weakness of the muscles, the deformity of the chest and the diminished elasticity of the thoracic tissues, all predispose to collapse of the lungs. Other thoracic deformities,—Pott's disease, tumors, enlarged lymph nodes, pleural effusion, pericardial effusion, pneumothorax, abdominal distension from gas, and other conditions, even more rare,

in which pressure is brought to bear upon the thoracic viscera may cause atelectasis. Any debilitating disease, by causing weakness of the thoracic muscles and the thoracic walls, may also be responsible. Bronchitis, especially in weakly children, may be associated with obstruction of the bronchial tubes, collapse of the alveoli affected, and atelectasis. Atelectatic areas thus produced may have a conical form.

The areas affected are usually scattered; they are congested, dark red or purple in color, slightly depressed below the surface of the healthy lung tissue, and are solid, or almost solid. Lobules are affected, but by the affection of adjacent lobules, considerable areas of the lung surface may show the collapse.

The symptoms resemble those of congenital atelectasis. The onset may be gradual, and not to be distinguished from the progress of the primary disease. Rapid, shallow respiration; recession of the soft tissues of the thoracic wall during inspiration; rapid, feeble pulse; cyanosis; dyspnea; subnormal temperature; these are the more usual symptoms.

The breath sounds are diminished; moist rales may be heard; and, rarely, small dull areas can be distinguished on percussion. But these findings may all be associated with the primary disease, and atelectasis may not be suspected until discovered by autopsy.

Treatment is the same as that already given for the congenital form of the disease.

Prognosis depends upon the primary disease. If the child recovers from this, the atelectasis soon disappears.

### **Pulmonary Edema**

This condition is rare in childhood. It is not a primary disease, but may be due to nephritis, valvular disease of the heart, bronchopneumonia, the acute exanthematous diseases, and to cachectic states, such as rachitis.

The lungs become edematous, firm, heavy, but do not sink in water. They may be congested and red, or may be grayish from the large amount of water and the diminished amount of blood. Often pneumonic tissue changes, atelectatic areas, and varying degrees of congestion or hepatization may be present.

The symptoms are indefinite. The condition may be suspected when edema elsewhere in the body is associated with abundant moist rales, cough, dyspnea, and cyanosis.

Except when it occurs suddenly, in nephritis, it is not an especially unfavorable symptom. Its existence suggests great weakness, and the serious character of the primary disease.

### Pulmonary Abscesses

Septicemia, bronchopneumonia, or any pyogenic focus anywhere in the body, may cause multiple pulmonary abscesses. Injury to the thorax, or extension of a pyogenic process from neighboring tissues, or the aspiration of a foreign body into a bronchus, may cause a single, localized abscess.

The symptoms are indefinite, in most cases. If the abscess breaks into a bronchus, a considerable amount of pus may be discharged. If this contains connective tissue fibers, pus corpuscles, and pyogenic bacteria, the diagnosis is positive. This rarely occurs.

Fever, irregular, with irregular and occasional chilliness, progressive weakness and anemia; variable cough and dyspnea; occasionally some pain in the chest; these are the more common symptoms, but any one of these may be absent; especially in weakly children,—and these are especially subject to such infections. Clubbing of the fingers is rather common.

If the abscess is large, a dull area may be found; the breath sounds are feeble, and empyema may be suspected. Unfortunately, this error is rarely discovered until an operation for empyema finds the lung next the thoracic wall.

The urine is that of fever in general.

The blood shows marked leucocytosis, as in any other pyogenic infection.

Aspiration may bring the pus, and thus the diagnosis be made; but in multiple abscesses this is uncertain.

Treatment. If a foreign object can be removed, either by coughing or by surgery, this results in complete recovery. In any other solitary abscess the treatment is surgical, when a distinct abscess can be localized. Aspiration of the pus may be sufficient, but resection of a rib with good drainage is usually preferred.

Tubercular or actinomycotic abscesses may drain for years, with intermissions and remissions and exacerbations.

Multiple abscesses can not be drained. For these the treatment described for pneumonia should be given. The outlook is serious, and while recovery may occur, it is hardly to be expected.

### Pulmonary Gangrene

This condition is rare. It is never a primary disease, but may follow bronchopneumonia with measles, tuberculosis of the bronchial glands, typhoid fever, or other severe wasting diseases in which the resistance of the body is greatly lowered. Putrefactive bacteria are essential.

Aspiration of septic or necrotic material, as in diphtheria or gangrenous stomatitis, or aspiration of foreign bodies may cause gan-



grene, provided the putrefactive bacteria gain entrance to the weakened tissues. Occlusion of a bronchus or of a blood vessel may permit invasion of the infarct by putrefactive bacteria. These gain entrance to the weakened tissues either by way of the inspired air, or by the blood, from the digestive system.

The gangrenous areas are usually scattered over the infarcted areas, or over the lungs generally, usually over the right lung only. The gangrenous area is at first rather firmer than normal lung, is blackish or greenish in color, and later breaks down into a slough with abundant pus.

**Symptoms** may be indefinite, or may be characteristic. The odor is distinctive, but may be absent. There may be abundant sputum, foul of odor, unpleasantly greenish in color, and containing necrotic lung tissue. In such a case diagnosis is easy; but this sputum may not be expectorated. Marked pallor; high fever, usually remittent; great prostration; very weak pulse, these are the common symptoms, but these may all be absent.

The physical examination gives the sounds characteristic of bronchopneumonia, abscess, pyothorax, or other lung conditions, according to extent and development of the gangrenous areas.

Treatment is almost hopeless. If the process is localized, surgical removal of the affected area may be helpful. If a foreign object initiated the disease, its removal may lead to recovery rather quickly, otherwise, the treatment for pneumonia is indicated.

**Prognosis.** Death is to be expected, but may, rarely, be avoided by correct treatment.

## CHAPTER XXXV

### DISEASES OF THE PLEURA

Children suffer from pleurisy as often as do adults, and empyema is especially common in children.

**Etiology.** The pleurae are innervated by the intercostal nerves, and rib lesions predispose to the infectious pleurisies. Rib lesions often cause pain which may be mistaken for ordinary dry pleurisy. Cases in which attempts at drainage have been made, with no flow from the needle, have been recorded, and subsequent osteopathic examination has shown a rib lesion; the correction of the rib lesion is, in such cases, followed by recovery.

In children pleurisy is probably always secondary to some other disease; most commonly disease of the lung itself. A very small area of inflammation near the surface of the lung may initiate very severe pleurisy, especially when some rib lesion predisposes to local infection. Any form of pneumonia or a lung abscess is usually associated with a varying amount of pleurisy. Tubercular processes in the lung are almost invariably associated with at least some degree of pleurisy. Any of the acute infectious diseases may cause pleurisy, especially scarlet fever, measles, influenza and typhoid; in these cases the lung is involved also, and probably before the pleural involvement. The possibility of primary pleurisy must be recognized.

Pleurisy often follows exposure in older children, as it does in adults. In these cases abnormal contractions of the intercostal muscles are associated with rib lesions, and it is often difficult to determine whether the rib lesion was present before the pleuritic disturbance, and thus was, perhaps, a predisposing factor, or whether the rib lesions follow the muscular contractions. Relief of the muscular contractions and correction of the rib lesions is followed by relief, in any case, unless the more serious pathological changes antedate the corrective treatment.

Infants suffer rarely, though pleuritic adhesions of great extent and marked strength have been found in newly born and even in premature babies; it is evident these were formed as a result of pleurisy some time before birth.

Several types of pleurisy are recognized, which differ in structure and in treatment.

#### DRY PLEURISY

(Fibrinous Pleurisy)

This form always accompanies pulmonary tuberculosis or pneumonia, in young children and babies. In older children it may be primary.

### Pathology

The pulmonary pleura alone may be involved, in mild cases. The surface of the lung shows a thin layer of fibrin, which is grayish, yellowish or greenish, according to the relative numbers of pus cells, leucocytes or erythrocytes entangled in the meshes of fibrin. In more serious cases, the parietal pleura is also involved, and the two layers become adherent. In recent cases the exudate is not adherent, but later it becomes organized and very firm adhesions result; the pleural cavity may be obliterated by the extent of the adhesions. Usually the process is localized, but by the simultaneous involvement of several areas, and by the extension of these, very considerable parts of the lung surface on one or both sides may become adherent to the thoracic walls.

In the tubercular dry pleurisy, grayish or yellowish tubercles may be found upon the pleural surface and lying within the meshes of the exudate.

**Diagnosis.** The symptoms include sharp pain, usually localized exactly and increased by deep inspiration; a short, annoying cough, and tenderness upon pressure over the area of the pain and around the vertebrae and head of the corresponding rib. The pain may not be felt upon the affected side, and may be referred to the abdomen, simulating appendicitis or peritonitis. Tenderness may be felt in the region to which the pain is referred, but is present also in the region of the actual inflammation, and around the head of the rib and neighboring vertebrae. No constitutional symptoms are referable to pleurisy alone.

A friction sound, superficial, present during expiration and inspiration, may be heard over the affected area, in most cases; this is not always to be heard. When present, it is pathognomonic.

When dry pleurisy complicates pneumonia, the sound just mentioned may be the only method of diagnosis, and it is not always present. It is probable that a certain amount of pleurisy always complicates pneumonia but is not always recognized.

**Treatment.** Thoracic manipulations must be given, if at all, with very great gentleness. Inhibition of the related centers relaxes the deep spinal muscles, improves circulatory conditions, and facilitates recovery. This pressure should be continued until relaxation is perceived by the fingers, and then immediately discontinued. This treatment should be given once each day, or oftener, according to the severity of the condition. Too frequent treatment may cause increased congestion; infrequent treatment prolongs recovery and permits excessive pain.

Mustard may be used for counterirritation; the skin should be slightly reddened. Warm applications may give relief. The affected side may be strapped with adhesive to prevent movement and extension of the inflammatory process; this often causes the pain to cease and stops the cough.

Recovery is to be expected within a few days, in non-tuberculous cases. Some thickening of the pleura is to be expected, and this may cause some slight later disturbance, especially upon another attack of pleurisy.

**PLEURISY WITH EFFUSION**

(Serous Pleurisy)

This form also is rare in young children and babies; it may complicate pneumonia, in these. In older children it is often tubercular.

The formation of an exudate often follows the dry pleurisy just described. There is, in addition, a flow of serous fluid from the capillaries, and this accumulates around the lungs. In children it does not tend to accumulate at dependent areas to so great an extent as is the case in adults, but it surrounds the lung more evenly; this accounts for the varying findings on physical examination.

The fluid almost always contains some bacteria, and thus the serous pleurisy usually terminates in empyema if the condition persists for any length of time. The fluid may be formed very gradually, or with remarkable rapidity.

**Diagnosis.** The symptoms vary. The small effusions associated with pneumonia cause none, except perhaps some increase in the dulness of the sounds. In other cases a very mild pneumonia may seem present, with slight fever, and rather severe localized pain; after a few days the thorax contains a considerable amount of fluid. In still other cases, the child has little or no fever, no pulmonary symptoms except shortness of breath, mild symptoms of prostration, pallor, weakness; the children do not seem ill, and do not wish to go to bed. Small serous effusions usually cause no symptoms not referable to the pneumonia or other disease which it complicates.

When greater amounts of fluid are slowly formed, increasing dyspnea and shortness of breath may be the only symptoms. When the fluid is formed rapidly, dyspnea, orthopnea, cyanosis, syncope, weak pulse, may result from pressure; these conditions may be fatal, sometimes, in children who have not seemed to be very sick with the pneumonia or other disease to which the pleurisy is due.

With recovery, the fluid is usually absorbed, leaving the pleura thickened and variably adherent. Occasionally the fluid persists, and a chronic condition results.

**Physical signs** are abundant, variable, and sometimes not trustworthy. Diminished movement of the affected side; bulging of the intercostal spaces; diminished vocal fremitus; dulness or flatness on percussion; bronchial breathing over the affected area; friction sounds around the limits of the fluid; these are common findings, but any one or more of these may be absent. If the effusion is on the left side, the apex beat of the heart is displaced, rarely the entire heart is completely displaced into the right side of the thorax.

Whether the fluid is serous or purulent can only be determined by an examination of the fluid. Great amount and leucocytosis are suggestive of purulent fluid, but the complicating pneumonia causes



leucocytosis while serous effusions are often of considerable extent.

**Treatment.** The child must be kept in bed, and must not be allowed to exert himself, if he feels so disposed. His position should be changed often. Hard crying must be avoided. Especially if the effusion is large, he must not change his position or sit up, suddenly: this may cause immediate death in children apparently not very ill previously. Counterirritation may be useful in diminishing the amount of fluid.

Rigidity of the thorax may be general, in which general relaxing treatment are indicated. Localized lesions should be corrected as quickly as is possible, but all manipulations must be carefully and gently performed.

Especial attention should be given to all conditions which might interfere with the functions of the liver, heart, kidneys and intestines.

When the amount of fluid is so great as to cause marked difficulty in breathing, or when the heart shows signs of distress, the fluid should be withdrawn, usually by aspiration. The aspirated fluid should be examined thoroughly and at once, in order that the nature of the infection may be determined, and also extent of the disease process. Rare diseases may thus be recognized in time, perhaps, for useful treatment to be given.

When the fluid is not absorbed, after two weeks or so, aspiration is indicated. Such retained fluid is almost sure to be purulent, and the outcome then is distinctly grave. The removal of a part of the fluid seems to relieve the pressure, and this permits absorption of the rest.

Aspiration is not indicated in ordinary cases. There is some danger of causing pneumothorax and of wounding the lung, especially by repeated aspiration.

## EMPYEMA

### (Purulent Pleurisy)

Empyema nearly always follows neglected pneumonia in children, and it is more common in children than in adults. The pleuritic symptoms may be more marked than the pneumonic symptoms, and the pleurisy thus seem to be primary. Any form of pyemia, appendicitis, peritonitis, osteomyelitis, etc., may initiate empyema. Injury to a rib, or directly to the lung, is another cause, not at all common in childhood. Tubercular infection is less common. Some strain of pneumococcus is present, either alone or a mixed infection, in about nine-tenths of all cases.

The conditions described in dry pleurisy are followed by those in serous effusion, this becomes purulent, which is empyema. Slight adhesions are formed; these form pockets which fill with the pus; the adhesive walls break down, and a considerable accumulation of

pus, arranged in sponge-like masses may be found at autopsy. The adhesive walls may become firm, and distinct pockets formed, though this is rather rare. Removal of the pus is thus difficult, since the pockets are not easily distinguishable.

The pus surrounds the lung, over the affected areas, and does not seem to accumulate according to gravity. The lung is thus subjected to pressure on all sides, when the fluid is considerable in amount. About a pint of pus is found in ordinary cases, though neglected patients may give two quarts or more.

**Diagnosis.** The physical findings are the same as those of serous effusion,—dyspnea, shortness of breath and pain in mild cases and syncope, orthopnea, cyanosis, weak pulse, displaced heart, with the symptoms of the pneumonia or other original disease. The left thorax is most often affected, hence the heart is displaced toward the right side.

The symptoms may be intimately associated with the preliminary pneumonia. Or, the fever of pneumonia may drop, as usual; then the fever rises again, gradually or suddenly. Empyema is always suspected with this temperature change after the crisis in pneumonia.

In the acute infectious diseases, pulmonary symptoms are first noted, with cough, dyspnea, or hyperpnea, and rapidly rising temperature. This is especially true in scarlet fever, measles, and other less common acute infections. In cases which seem to be primary, the onset is sudden, resembling that of pneumonia. The pus begins to accumulate very soon, and within three days empyema may be typical and marked. In older children, more rarely in young run-arounds, the onset may be gradual, with slight fever, slight dyspnea, slight cough, slight cachexia. Empyema may not be suspected until several days or a week, or even more.

In all cases of empyema the leucocytosis is marked; from 20,000 to 50,000 leucocytes, of which about 80 per cent are neutrophils.

Pallor, anemia, weakness, dyspnea, cough, variable but always high temperature, loss of weight, these are common early symptoms. Hyperpnea is always present, in typical cases. Diarrhea is very common. As time goes on, the weakness and anemia become more marked, fever diminishes, cough ceases, but still the child does not recover. Clubbing of the fingers is very common, in the later cases. Albuminuria is frequent, and there is apt to be some curvature of the spine. The deformity of the thorax may be marked. Tuberculosis is usually suspected.

### Treatment

Prevention is of first importance. Children under osteopathic care do not suffer from this disease, except under very unusual conditions. In the early stages, the treatment for pneumonia is indi-

cated. When the abscess becomes localized more drastic measures are needed.

Surgical treatment is indicated. Several operations are performed, according to individual conditions and the preference of the surgeon.

**Aspiration** is not successful in empyema, though it is the operation of choice in serous effusion. It is not possible to remove the pus completely or thoroughly; large fibrinous masses can not be removed at all by aspiration; and if heavy pus is present the lung may be wounded or pneumothorax caused by aspiration. If the abscess is staphylococcal, and the pus is thin, it may be fairly well removed by aspiration; if the amount of fluid is large and the pressure symptoms are marked, aspiration may be done very quickly and relief secured, but a later operation is probably necessary. If both lungs are involved, one side may be aspirated and the other subjected to a more complete operation.

**Incision and drainage.** If no immediate danger is apparent, this may be delayed until the most acute period has passed. If the child seems very sick and the sepsis increasing, immediate incision is necessary. Local anesthesia is to be employed, if possible. An incision large enough to permit two small tubes to be inserted into the abscess cavity is made, the tubes inserted and dressing applied. The pus drains away rather slowly, and in most cases the results are good. It is not a serious operation, there is little danger of pneumothorax, and the slow emptying of the abscess does not cause shock. On the other hand, the ribs may be approximated and pinch the tubes, or the pressure of the tubes may cause necrosis of the ribs. Large masses of pus and fibrin may fail to pass through the tubes and may occlude their lumina.

**Rib resection.** This may become necessary after the simple incision, or it may be employed at first, especially in children four years old or more. A piece of rib, usually about an inch long, is resected, and drainage established through this opening. Large masses of fibrin and inspissated pus can be removed through this larger opening. Adhesions may be broken down and fairly complete cleansing secured.

**Siphon drainage.** This is most useful for babies. An opening is made into the chest just large enough to receive a large drainage tube. The tube is tightly strapped and covered with collodion so that no air can enter. This drainage tube is connected by means of a glass tube with a long piece of rubber tubing, and this, in turn, runs into a wash bottle placed upon the floor, usually beneath the bed. The wash bottle (or a glass dish) contains sterile salt solution, and the drained material passes into this. The flow may be watched at all times, or a specimen removed for examination. A clamp should

be placed around the tube when the wash bottle is removed for cleansing. This method prevents secondary infection, avoids the entrance of air into the thorax, encourages the expansion of the lung, and avoids tiresome changing of dressings. It has the trouble that the tube may become occluded. Sometimes it may be cleaned by suction; if not, it is necessary to remove it and clean it. In this changing secondary infection may occur or pneumothorax caused. If the tube should become occluded a second time, the ordinary methods should be employed, as in simple incision.

The pleural cavity may be washed out, after two days or more of drainage with Dakin's solution or some other aseptic nonirritating solution. This may be repeated, if indicated, several times each day, for a week or more. The drainage usually persists for three weeks or so, and recovery may require as much longer.

After drainage has begun, the temperature should fall and the child seem much better in every way. Persistent fever after the drainage is well established may mean that the drainage is imperfect; or that pneumonia has occurred or is extending; or that other organs have been affected. The peritoneum, pericardium and meninges are to be considered in this connection.

The drainage tube should not be allowed to remain too long, else the sinus due to its presence may not heal readily.

**Thoracoplasty.** Long neglected cases may require further surgical treatment. When the greatest expiratory movements still leave a space between the chest wall and the lung, and after all of the non-surgical measures to be given later have failed to secure adequate respiratory ability, thoracoplasty may be considered. This is a serious operation, and, at best, produces marked deformity. Parts of several ribs are removed, permitting the chest to collapse enough so that the lung fills the remaining space, at forced inspiration and at forced expiration. This is only to be done as a last resort, on account of the deformity produced, and also because the breathing ability is thus permanently diminished.

**Convalescent treatment.** Aside from the surgical treatment of the abscess, the treatment of the child with empyema is that of the pneumonia or other primary disease.

After the drainage of the abscess, a return to strength may be hastened by the treatment already indicated during convalescence from pneumonia.

In order to secure expansion of the lung, during recovery, certain methods are advisable. The cough itself helps in expansion, and this may be enough to secure excellent recovery.

Raising the ribs, with forced inspiration, and following them down during expiration, is good. Exercises which raise and lower the arms, with forced inspiration, are good. Various games with



blowing, blowing soap bubbles, blowing tubes of water, or playing upon some wind instrument, are all good. Increasing the respiratory muscles may be accomplished by games with throwing, as tennis or ball, or by definite exercises, preferably in the open air. All methods of increasing physical vigor are indicated.

### CHRONIC ADHESIVE PLEURISY

As a result of acute attacks of pleurisy, a chronic inflammation may be initiated. A single attack may leave adhesions so located as to be a continual irritant, and thus the chronic form be caused. Several successive attacks are rather apt to produce the chronic state.

Infectious agents may or may not be present.

The pleural cavity is the site of many adhesive bands; the two layers may be adherent for large areas over the affected lung. The cavity may be completely obliterated.

The symptoms are not definite. Some dullness; diminished breath sounds; some slight friction sounds, may or may not be recognizable.

At autopsy, after death from other than pulmonary disease, quite marked adhesions may occasionally be found, in children in whom no history of pulmonary or pleural disorder could be found.

Treatment must be devoted to increasing the strength of the respiratory muscles, and building up the general health, as in chronic pneumonia.

## PART IV. CIRCULATORY DISEASES

### CHAPTER XXXVI

#### Establishment of Circulation at Birth

The changes which occur at birth affect the circulation very profoundly. During intrauterine life the lungs have not been expanded, and only the nutritive requirements of the pulmonary tissues affect the circulation. The pulmonary circulation, as it exists in the body after birth, is not in action. Oxygen is received from the placenta, and carbon dioxid is discharged by way of the placenta.

The right auricle receives blood from the superior vena cavae, and this blood is venous in character; it also receives the blood from the inferior vena cavae, and this blood is mixed, containing venous blood from the body of the fetus, and also blood which is arterial in quality, from the umbilical vein. The greater proportion of the blood from the umbilical vein has passed through the liver, before it reaches the heart, but a smaller proportion passes directly to the heart by way of the ductus venosus. From the right auricle the blood passes through the foramen ovale into the left auricle, and thence into the aorta and the systemic circulation, as in extrauterine life. The left auricle receives also the venous blood from the lungs, which supply them with the nutrition required for their growth and development. This blood, it must be remembered, is venous until after birth. The wholly venous blood, from the superior vena cavae, passes, for the most part, into the right ventricle, whence it enters the pulmonary artery; a small amount passes to the lungs, for their nutrition, but most of it passes into the aorta, through the ductus arteriosus.

It seems to be the practically horizontal direction of the entering blood from the inferior vena cavae which causes it to pass through the foramen ovale, and the descending direction of the blood entering from the superior vena cavae which causes it to pass into the right ventricle, through the right auricle.

Since the blood from the pulmonary artery, completely venous in character, enters the aorta through the ductus arteriosus after the carotids and the subclavian arteries have been given off from the aorta, it is evident that, during intrauterine life, the head and upper limbs are somewhat better nourished than is the rest of the body,—except the liver.

At birth, very sudden and profound changes occur. Respiratory action causes sudden fall in the intrathoracic pressure, and the blood of the pulmonary artery flows abundantly into the lungs, through the pulmonary arteries; the pulmonary veins are speedily filled, and the blood entering the left auricle suddenly increased in

amount. The ductus arteriosus becomes useless. The pressure in the right auricle becomes diminished suddenly, and the foramen ovale becomes useless. These openings soon show proliferations in the cells of their peripheral boundaries, and are then filled up; the excess of new tissue becomes absorbed, and scarcely a trace of them is to be found in adult life. The ductus arteriosus disappears, normally, within a few days; the foramen ovale within two weeks. Rarely the openings persist, causing no symptoms or symptoms of varying severity according to the size of the opening and according to co-existent abnormalities of the heart and vessels.

When the cord is ligated, the umbilical vessels are closed. The blood within them coagulates; the pressure in the hepatic vessels and the portal system diminishes; the ductus venosus becomes useless, and it, also, undergoes proliferation of its walls, becomes closed, the new tissue is absorbed, and only a small cord of connective tissue remains in adult life.

The circulatory changes are associated with increased oxygenation of the blood; since the pulmonary aeration provides for arterial blood for all parts of the body; and also provides more efficient aeration of the blood.

**The infantile peculiarities** of the heart add to the difficulties of diagnosis of the circulatory diseases in children. For this reason, some discussion of the symptoms and the physical findings may be of value.

**Size.** At birth the heart weighs about 24 grams, or about one-twelfth as much as the average adult heart. It is about .76% of the body weight at birth, and about .46% of the body weight in adult life. During the years of early childhood the heart lags somewhat behind the body in growth, reaching its smallest size, relative to the size of the body, at about the seventh or eighth year. After that it increases in size rather more rapidly, so that a physiological hypertrophy is present during the years of puberty.

**Position.** The heart of the baby is more nearly horizontal than it is in the adult. The limits outlined on percussion are very differently described by different authors. The averages are as follows: Relative dullness, during the first year, second left rib or interspace; to right parasternal line; and one or two centimeters beyond the left nipple line. The width at the level of the nipple is about 7-8 c. m.

At six years of age, relative dullness reaches the second interspace; to the right not quite to the parasternal line; to the left to the nipple-line or barely beyond it. The width at the level of the nipple is about 10-10.5 c. m.

At twelve years, the relative dullness reaches the third rib, the right edge of the sternum, or barely less; and the left nipple line. The greatest width is about 11.5 c. m.

The lower boundary of relative dullness passes into the dullness of the liver.

The dull area is always larger in children, proportionately, than in the adult.

The X-ray plate or a fluoroscopic examination gives the most accurate information as to the size and position of the heart.

**Apex.** The exact location of the apex beat is scarcely to be definitely decided, on account of the area involved. It is variously described with averages as follows:

First year: fourth interspace, left of mammary line;

Second year: fourth interspace; mammary line or slightly to the left;

Third to sixth years, fourth and fifth interspace; mammary line.

Seventh to twelfth years, fifth interspace; mammary line, and slightly to the right of the mammary line.

Slight variations are not to be considered diagnostic. A variation of 2 c. m. probably has diagnostic significance.

Pott's disease, rickets, spinal curvature, or other deformities of the chest may cause abnormal locations of the apex beat and also of the areas of relative and of absolute dullness.

Bulging of the precordia is very frequent in cardiac disease in childhood. When present, it is pathognomonic. Its absence does not eliminate cardiac disorder, however.

**Sounds.** The cardiac as well as the respiratory sounds are much louder and rougher in the child than in the adult, and they vary to greater extent, normally, than do the sounds heard in the adult thorax. The rapidity of the pulse makes it difficult to distinguish between the first and the second sound in children's hearts, and especially in babies' hearts.

**Murmurs,** in childhood, are abundantly present; very often when no pathological condition can be discovered. "Accidental" murmurs are often found in childhood, between the sixth and the twelfth years. They are rare in infancy or before four years of age. They are systolic in time; are heard over all the precordia; never replace any normal heart sound; are not transmitted along any of the great vessels; they are not heard if the child holds the breath at the end of expiration; they are not associated with cardiac hypertrophy or with symptoms of cardiac inefficiency. They are also called "cardiopulmonary" murmurs. While the cause of the sound is not certainly known, several theories have been suggested. Probably they are due to forcing the air in and out of the alveoli nearest the heart, during systole and the rebound. Care must be taken to avoid confusing these murmurs with the murmurs of early cardiac disease. No treatment is necessary, since no harm results from the condition.



Murmurs due to functional inefficiency of the heart are rather common; they may be due to any cause which interferes with a normal relation between the action of the heart and the pressure of the blood. Toxemia from whatever cause; anemia; early endocarditis or pericarditis or myocarditis; or disturbed innervation of the heart may cause them. They are found in children with rib lesions or mid-thoracic or upper-thoracic or cervical lesions, in order of frequency. They are soft in character and are not transmitted into the axilla or along the great vessels, which differentiates them from valvular murmurs; they are associated with symptoms of cardiac inefficiency and with increased cardiac dullness, usually, which differentiates them from accidental or cardiopulmonary murmurs.

Functional murmurs often disappear after careful osteopathic treatment. This fact may help in the diagnosis of functional murmurs, though murmurs due to slight valvular lesions may also disappear temporarily as the result of increased efficiency of the heart due to osteopathic treatment. Functional murmurs may be eliminated permanently by the correction of bony or other lesions responsible for the cardiac inefficiency. Very often a mistaken diagnosis is made, in which case what appears to have been a valvular murmur disappears immediately and permanently after correction of lesions affecting the action of the heart.

Functional murmurs due to abnormal conditions affecting the vascular field, such as dilatation of the splanchnic vessels, also disappear when the discrepancy between systemic demands and cardiac ability is diminished, as the relief of these circulatory abnormalities diminishes the demands made upon the heart.

**Pulmonic sounds** are often exaggerated during childhood, even in apparently healthy babies and children.

**Venous hum.** A rather low-toned, long-drawn musical note, a humming sound, is often found around the root of the neck and over the great vessels, in children of eight to twelve years. Its cause is not known. It is most often found, and is loudest, in anemic or weakly children, but may be found in those apparently healthy. Pressure of enlarged thymus or mediastinal lymph nodes has been suggested as a cause; also an increased fluidity of the blood.

**Congenital murmurs.** During the first and second years of life, nearly all cardiac murmurs are due to congenital defects. Any murmur heard before a child is three years old, associated with increased dullness, may be considered diagnostic of congenital valvular lesion or lesions. Any very loud and harsh murmur, even without increased dullness, indicates congenital lesions; the "humming-top" murmur, continuous through the cardiac cycle, or any kind of murmur with perceptible "thrill" or with a tendency to

cyanosis or other symptoms of cardiac inefficiency, indicate congenital lesion, in babies under two or three years of age.

Congenital defects are so often complicated with other developmental defects, and the effects of cardiac defects in babies are so serious, that such children rarely live long.

**Symptoms** of cardiac disease in children do not vary greatly from symptoms in similar conditions in adults.

Cyanosis may be present in atelectasis, but usually indicates cardiac disease, when it appears in children.

Edema is less common in children than in adults, and when it does occur as a complication of cardiac disease, its significance is correspondingly serious.

Cough is frequent in the cardiac disease of children, especially of babies.

Liver enlargement and tenderness is more common than edema, in valvular disease in children.

Dyspnea is a more common and an earlier symptoms of valvular disease in children than in adults. It may occur in pulmonary diseases as well as in cardiac diseases; and may be found, in mild degree, in several other diseases characterized by acidosis.

Precordial pain is less common in children than in adults. Contrary to the usual opinion, children more often fail to complain, or, perhaps, fail to be conscious of pain than is the case in adults.

The bruit or murmur found in patency of the interventricular septum is superficial and is usually accompanied by a thrill. It is not easily identified during life.

The sounds of pericardial friction are not easily identified. They may be attributed to the correct source when other symptoms of pericarditis are associated with sounds caused by the to-and-fro movements of the heart.

**Heartblock** is rarely congenital, and is even more rarely found in children as an acquired disease. When congenital, it is due to the failure of development of the atrioventricular bundle (muscle bundle of His.) With care, development may occur at any time in later childhood, if life persists and if conditions are favorable.

**Pulse.** The pulse rate is much more irregular in children, normally, than in adults, and it is more easily modified by slight environmental changes. Slight digestive or nervous disturbances are often enough to cause apparently very serious variations in the rate and in the quality of the pulse, in small children. The following rates are averages for normal children:

First year, 105-115 per minute.

Two to six years, 90-105 per minute.

Seven to ten years, 80-90 per minute.

Eleven to fourteen years, 75-85 per minute.

It is about ten beats per minute more rapid in girls than in boys; this seems to be a sex characteristic, though it is subject to rather frequent variation.

**Tachycardia** has little significance in childhood, unless the rapidity is very considerably increased, without recognizable normal cause. If the pulse rate does not diminish after moderate exercise; or if it is associated with other symptoms of cardiac disturbance, it may have importance in diagnosis. It may be due to upper thoracic lesions; in which case correction is indicated.

**Bradycardia** may be an idiosyncrasy, but is rather less often found normally than is tachycardia. It is common in jaundice of any type, and in certain other forms of toxemia. It is especially significant during any of the infectious diseases; and may be an early symptom in cerebral diseases. It may be due to cervical lesions, or upper rib lesions. These should be corrected.

**Arrhythmia** is frequently present in normal sleeping children, especially in little babies. It is present in nearly all serious diseases of childhood; but is rather less often found in cardiac diseases. It is often present in functional nervous attacks, or as the result of emotional or other excitement. Its value in diagnosis is therefore slight. Arrhythmia may be due to lesions affecting the cardiac centers,—upper thoracic, cervical, or rib or clavicular lesions may be concerned in affecting the cardiac action. These lesions may be due to birth accidents, or to improper handling of a baby, or to any of the accidental strains of childhood. Correction of the lesions may result in very speedy relief of the symptoms.

**Blood pressure** varies so greatly in normal children under similar conditions, and in the same child under varying normal conditions, that its determination is of little value in diagnosis. It is difficult to secure accurate blood pressure readings in children; and even when accurate readings are secured, they are of little value in diagnosis.

**Sphygmograms** give little useful information in children. The same thing is true of cardiograms. The records secured by these instruments may often be of scientific value, but as a means of diagnosis they are far less useful in children than they are in adults.

**X-ray plates** and fluoroscopic examinations are very valuable. They give the size and position of the heart; the extent of its motions; any evidences of pericarditic adhesions, and many other useful facts.

## CHAPTER XXXVII

### DISEASES OF THE HEART IN CHILDREN

(By C. Paul Snyder, D. O.)

The heart affections of children are both congenital and acquired. Congenital affections are due to defective development or they result from foetal endocarditis. A pre-natal endocarditis affects more frequently the right chamber of the heart; while one developing after birth is usually in the left side. The causes of deformities are considered in Part I of this book.

**Cardiac murmurs** not due to congenital lesions are summarized by Soltman as follows: anemic, pulmonary and endocarditic systolic murmurs.

**Anemic murmurs** are rare the first four years, but they are comparatively common at puberty, at which time anemia and chlorosis are prevalent. The low blood pressure in the ventricles and large source of origin of the great vessels explains their infrequency. At puberty the blood pressure is high in the ventricles. In chlorosis nature makes an effort to make up for devitalized blood by an increased amount. These murmurs are heard loudest at the pulmonary orifice. They are systolic in time. The second sound is accentuated and the apex beat is displaced down and out in proportion to the hypertrophy of the left ventricle. Functional basal murmurs in young children and anemic infants cannot readily be distinguished from those due to congenital disease.

**Pulmonary murmurs** are usually systolic in time. They hold definite relation to respiration, being increased during forced respiration and suspended by cessation of respiration. They are common in children with deformed chests, due to rickets or Pott's disease.

**Endocarditic systolic murmurs** are heard in mitral insufficiency. The murmur is systolic in time and heard at the apex, being transmitted towards the left axilla. With this there is cardiac enlargement and accentuated second sound over the pulmonary area. High blood pressure in the pulmonary artery of the child may produce pre-systolic sounds that are transmitted to the apex.

### CONGENITAL DISEASES AND DEFORMITIES

The most frequent combination lesions of congenital disease in children are classified by Holt as:

1. Infrequency pulmonary stenosis combined with defective ventricular septum.
2. Infrequency pulmonary stenosis with defective auricular septum.



3. The first two associated with patent ductus arteriosus.

Congenital anomalies mentioned in order of their frequency are classified as follows:

1. Defective ventricular septum.
2. Patency of foramen ovale.
3. Pulmonary stenosis.
4. Patent ductus arteriosus.
5. Abnormalities of the great vessels.
6. Anomalies of the right and left auricle-ventricular orifices.
7. Stenosis of aorta.
8. Ectopia cordis.

1. **Defect of Ventricular Septum.** This anomaly is most frequently associated with other abnormalities of the heart, such as stenosed orifices or defective auricular septum. The effect of an unnatural opening between the ventricles is a propulsion of some of the blood from the left ventricle into the right ventricle during the constriction of the former. Should the right ventricle not sufficiently hypertrophy to dispose of the extra amount of blood thrown into it, there results an embarrassed respiration and obstructed venous circulation, with cyanosis and transudation of serum into the connective tissue and body cavity. This, and not the mixing of venous blood, is the cause of cyanosis.

The diagnosis of ventricular septum defects can be made by the following signs: A loud systolic murmur over the entire precordial area and in the interscapular region, but not transmitted along the stream.

2. **Patency of the Foramen Ovale.** Of itself does not entail, as a rule, any disadvantage upon the individual. Unless there be associated other congenital or acquired conditions, affecting the pressure in the right auricle, the blood will not flow in any great quantity from right to left auricle. Increased pressure in the right auricle or an obstruction to the escape of blood from the right ventricle will produce mixing of venous and arterial blood, resulting in cyanosis and shortening of the child's life.

The foramen ovale is closed, normally, by a membrane at about the time of birth. This is brought about by the increased flow of blood upon institution of respiration. Absence or defective development of the membrana ovale, or defective respiration may fail to close the foramen. The diagnosis of a persistent foramen ovale can be made by cyanosis without heart murmur. There may be cyanosis with systolic and presystolic murmurs over cartilages of the third and fourth ribs. Other causes for cyanosis must be considered and, also, the fact that an open foramen uncomplicated may present no symptoms.

3. **Pulmonary Stenosis.** The cause of atresia of the pulmonary valve is invariably intra-uterine endocarditis. Anomalies of the

pulmonary orifice include: stenosis, atresia of the orifice and of the artery, and stenosis of the conus arteriosus.

Disease of the pulmonary artery is one of the most common of the congenital heart affections. The length of the child's life depends upon the amount of constriction of the pulmonary orifice. Severe constriction of the orifice will bring about enormous dilatation of the cavities and muscles of the heart, without special symptoms until extra strain is placed upon the heart by congestion of the lung, or pneumonia, when sudden death is apt to occur.

The symptoms are: Bodily warmth impaired, clubbing of the finger nails, cyanosis with impaired respiration and palpitation. Mental and physical impairment may characterize the patient throughout life.

In auscultation we will note a pre-cordial thrill, murmur over the second and third left costo-sternal junction and increased area of cardiac dullness.

Complete atresia of the pulmonary orifice is less common than stenosis. The condition comes from the imperfect development rather than disease and is often associated with patent ductus-arteriosus.

The symptoms of atresia are more pronounced and prognosis is less favorable than stenosis. There is intense cyanosis and dyspnea and the patient usually dies in convulsions.

4. **Patent Ductus Arteriosus.** In the normal heart the ductus arteriosus is closed by the end of three weeks after birth. The ductus arteriosus is closed by the growth of cells in the inner wall.

A persistent ductus arteriosus is brought about by the imperfect institution of respiration, an abnormality of the pulmonary circulation, by puerperal infection of the new born with infected thrombi, or by defects in cardiac development allowing the duct to remain open.

Clinical symptoms: Rapid hypertrophy, dilatation of pulmonary artery, dilatation of right ventricle, cardiac dullness, increased thrill over upper part of sternum and systolic murmur. Severe dyspnea and cyanosis, often a tendency to congestion of the lungs and general anasarca. The prognosis is unfavorable.

Hirst gives of sixteen cases:—seven died in childhood, five lived from nineteen to thirty years and four lived to between forty and fifty years.

5. **Abnormalities of the Great Vessels.** Abnormalities in the origin of the great vessels are rare. This condition leads to an early death, or makes extra-uterine life impossible, unless there is an open foramen ovale or a communication between the pulmonary vein and the right side of the heart.

6. **Anomalies of the Right and Left Ventricular Openings** are as a rule the result of intra-uterine endocarditis with a thickening of the auriculo-ventricular valve, or the chorda-tendineae are shortened and thickened, producing stenosis and general valve defects.

The right heart is more commonly affected than the left. The thickening of the tricuspid valve necessitates circulation in a round about way. There must necessarily be a defect in the ventricular septum. The blood flows from right to left auricle and from the left ventricle and in part from the right ventricle to pulmonary artery. Overwork of the left ventricle may bring about hypertrophy and often dilatation.

The left auriculo-ventricular opening is less often affected than the right. If stenosis of the mitral valve is marked the blood flows from the left auricle back through the patent foramen ovale into the right auricle, thence to the right ventricle, then by way of the ductus arteriosus into the aorta.

The left ventricle, becoming functionally more and more useless, undergoes atrophy, sometimes to a very marked degree. At the child's birth the left side of the heart and especially the left auricle is embarrassed, the result being extreme cyanosis, congestion of the lungs and early death.

7. **Stenosis of Aorta.** Obstruction of the aortic opening does not differ from that of pulmonic stenosis; they both are either developmental defects, or the result of endocarditis. Of the five cases of this type only one survived the third month. The prognosis depends, however, upon whether there is mere thickening of the aortic valves, valve rings, or a stenosis of the opening. Some authors claim these are but degrees of the same condition.

The degree of stenosis varies considerably. The thickened valves may be joined together, leaving only a central aperture, or they may be crumpled and deformed, or they may be adherent in addition to the ring of the valves being much thickened.

This condition leads to a slow development of the child. A diagnostic feature of this hypertrophy of the left ventricle is a relatively powerful heart with a small pulse.

8. **Ectopia Cordis.** This is a rare congenital malformation of the heart. The heart may be double, displaced into the neck or abdomen. Some anomaly of the chest or sternum is apt to be associated with this condition.

### Symptoms

The symptoms of congenital heart conditions arise from faulty aeration of the blood producing cyanosis, and not the mixing of arterial and venous blood, the prime factor being the disturbance of the systemic circulation. As a result of the above mentioned conditions we may give the clinical picture as follows:

(1) Cyanosis is the most frequent and striking of all symptoms. No doubt it is brought about by the faulty aeration of the blood.

(2) Clubbing of the finger nails and toes is a later symptom. It is usually preceded by a reddish or shiny appearance of the skin over the extremities. The soft tissues are affected rather than the bone.

(3) General wasting and retardation of growth is brought about by the conditions of stenosis more especially. The patient refuses any great amount of nourishing food, and is stunted in growth.

(4) Labored respiration or disordered breathing is of great significance, and is followed by paroxysms of cardiac failure.

(5) Syncopal attacks may attract attention, often assuming alarming proportions, especially if the patient is unconscious for any length of time. Epileptic attacks often precede syncope.

### ORGANIC DISEASE OF THE HEART IN CHILDREN

Valvular diseases of the heart in the child do not differ radically from those in the adult. Functional and infectious diseases in the heart at this period of the child's development do have many differences when taken in detail. We propose to deal chiefly with these differences.

#### Pericarditis

The first step of Pericarditis is a deposit of micro-organisms by way of the capillaries of the coronary arteries in the parietal and visceral layers of the pericardium.

Coagulation necrosis is less liable to occur in the child, but effusion is more marked than in the adult, with the exception of renal disease and suppurative pericarditis.

Recuperative processes consist in the destruction of micrococci by leucocytes. The fluid that has been exuded is absorbed and layers of fibrous deposit are organized, at this stage the two surfaces of the pericardium come into contact, becoming adherent. This marks the beginning of adhesions.

Suppurative Pericarditis is much less common than rheumatic forms. It follows such infectious diseases as measles, whooping cough and influenza.

This is invariably secondary to some other disease, i. e., rheumatism or an infectious disease such as scarlet fever. In the infectious diseases the pericardial involvement comes at about the second or third week.

**Symptoms.** The violence of the symptoms differs. The early stage is apt to be insidious,—weakness and general wasting associated with pain over the pericardium, palpitation and dyspnea. There is a moderate rise in temperature, the face is pale and anxious with apparent mental distress.



**Physical Signs.** Pulse rapid, not sustained, and blood pressure low. In severe cases the pulse is running in character. The pericardial friction may be either systolic or diastolic in time. The area of precordial dullness is increased in proportion to the dilatation and effusion.

**Prognosis.** There are two aspects to consider in making a prognosis: (1) Immediate outlook. (2) Outlook for the future.

(1) Prognosis is good except in chronic and relapsing types and a heart already damaged by rheumatism or severe chorea.

(2) Prognosis as to future is uncertain, especially as to the possibility of recurrence.

Mild cases often make wonderful recoveries, especially if care and plenty of time are given to convalescence, and treatment is persistent.

**Treatment.** In pericarditis this is palliative, including prolonged rest and open air living. All constitutional conditions should be brought under control.

Stimulate the heart through the upper dorsal (child on back, do not move patient) when pulse becomes feeble and weak. Later osteopathic treatment the same as given under treatment for general heart disease.

Blisters are not favored, local poultices may be used with a temperature under 101 F., above that use ice bag suspended over the precordia, this gives much relief.

Paracentesis is seldom demanded except in cases of urgent pressure symptoms, and in those cases which are found to be purulent.

## ENDOCARDITIS

Inflammation of the endocardium is a frequent disease of early life. The bacterial invasion is carried to the valves or caps through the same channels by which the nutritive material is supplied to them. The necrotic and swollen tissue of the valves forms a series of small vegetations, which in the early stages are red, later yellowish. The whole valve may become thickened and stiff. This same process often includes the chordae tendinae. The vegetative growths may become so large as to interfere with circulation. On the other hand they may become loosened and float in the blood stream. In either case the result is apt to be contraction, shortening and thickening of the valves as well as the chordae tendinae.

Contrary to congenital heart disease, where the right heart is more frequently affected, we have here the left side more often involved. First in the order of the frequency of involvement is the mitral; next in order comes the mitral and aortic together; then the aortic valve alone. The tricuspid is less apt to be affected, and the pulmonary least apt to be affected.

**Etiology.** Rheumatism is the most frequent cause of endocarditis. Occasionally scarlet fever is complicated by endocarditis. Other complicating diseases we occasionally find in inflammation of endocardium are diphtheria, septicemia and measles. Bear in mind also its occasional association with chorea. The heart should be watched in all these diseases.

**Symptoms.** The symptoms which usually attract attention are: Vague pains over the precordium; palpitation; shortness of breath on slight exertion; slight fever; pallor and later wasting.

**Physical Signs.** These depend a great deal on the valve affected. We will use for illustration endocarditis of the mitral valve. This condition produces mitral regurgitation. The first sound of the heart in the region of the apex is altered in character. This is rougher and shorter than usual; later the appearance of systolic adventitious sounds transmitted towards the axilla; still later the usual signs of acute dilatation appear followed by hypertrophy and chronic heart disease.

In chronic heart disease the symptoms are aggravated by endocarditis. Old lesions are musical, rough or harsh. New lesions are apt to be soft and blowing. Being familiar with the patient's heart makes a new murmur easier of diagnosis.

The prognosis depends a great deal upon the disease with which the endocarditis is associated. Simple endocarditis is never fatal. The malignant form is very fatal.

The remote prognosis of chronic valvular disease depends upon the valve affected and the ability of the heart to compensate for the valve impairment.

Loudness of the murmurs is of little importance, but the greater the number of murmurs the more serious is the condition.

The constitutional diseases associated with endocarditis should receive the first consideration. In all constitutional or infectious cases consider the possibility of endocarditis.

**Treatment:** Prolonged rest is admitted to be the most important factor in the treatment of acute valvular disease.

Protect the surfaces of the body night and day from cold and dampness. An enema each day is often of great value. Attend to all gastric symptoms promptly. It may be necessary to stop milk for at least twelve hours, giving barley water. Local applications are of less value than in pericarditis.

Osteopathic treatment should be given each day with especial attention to removing all irritation and contractions. Avoid producing severe reactions. Work to remove any source of constitutional interference. The child must not be wearied by any avoidable circumstances.

## FUNCTIONAL AFFECTIONS OF THE CHILD'S HEART

### (Neuro-Muscular Affections)

This is the most difficult chapter in heart diseases. On the other hand it is the most interesting. It is my belief that very few cases of this type that receive osteopathic treatment fail to respond wholly or in part. It stands to reason that all nerve channels should be free from all interference of every character.

Lesions of whatever character should be removed allowing nature's force full chances for recuperation.

The functional affections of the heart which occur in childhood are:

1. Motor disturbance:
  - (a) Rate.
  - (b) Rhythm.
  - (c) Force.
2. Sensory disturbance:
  - (a) Pain.
  - (b) Distress.
  - (c) Heart consciousness.

1. **Motor Disturbance.** (a) Under the heading of disturbed rate we have two conditions; one paroxysmal bradycardia, or Stokes-Adams syndrome. This is rarely met with in childhood. The other is characterized by the great frequency of the pulse (tachycardia).

Infrequent pulse may be met with physiologically in some children. It may be the result of nervous affections, diseases of the brain or cord. It may be from reflex conditions such as severe colic. Infectious diseases, such as diphtheria, at times may depress the rate of the pulse.

(b) Sudden increase of heart rate with disturbed rhythm is apt to be associated with nervous temperament; in children of nervous and insane parents; in those children who have suffered early exposure and privation.

(c) Disturbance of force is slightly more frequent in female than in male children. Disturbed digestion, hyperthyroidism and anemia are contributing causes.

2. **Sensory Disturbances:** (a) Pain in the heart comes primarily as a result of organic disease. However there may be other existing causes such as microbial toxins, nervous excitement, sudden shock, violent emotion, renal disease, or the result of gastric or general abdominal distension.

Pain or distress may be felt over entire precordial area but it is more commonly felt at apex. Stabbing pain over the precordial area is rare in the child, as compared to that of the character of angina pectoris as it is found in the adult.

**Prognosis** is good under proper osteopathic treatment. Nature favors every effort for return to the normal. Organic disease does not follow functional disorders unless some new process is initiated.

### MANAGEMENT OF HEART CONDITIONS OF CHILDREN

The management of a child with a damaged heart must be strictly individual and based on an intelligent predetermination of the nature and extent of the lesion and the degree of remaining cardiac competency. Everything must be done to favor nature's efforts to establish compensation. The education, amusements and activities of these children are matters for individual consideration, and a careful regimen may prevent their becoming mental and physical invalids. Wholesome and guarded exercise is necessary. Racing and other violent effort is out of the question, because of the undesirable muscular strain. Avoid exercises that produce pallor and severe breathlessness.

Large public schools should be avoided in those children with grave lesions of the heart. The parents should be warned that tonsillitis or sore throat followed by pain, nervousness with wasting, may be indicative of a renewal of the heart disease. The rapid growth of the child during the period of puberty does not necessarily affect the heart. On the other hand if the heart disease is severe it is more apt to affect somatic development, especially if the condition is that of mitral stenosis.

The diet should be well balanced. Adenoids and diseased tonsils should be removed.

The bowels should be regulated, preferably by dietetic means. Clothing should be adequately warm but not too heavy and the extremities especially well protected. Blood pressure is not so important in a child as in the adult. Stimulants are not necessary, especially under regular Osteopathic attention.

Exercises should be regulated according to the severity of the case. We may classify these as follows:

1. Exercises in prone position. Almost any variety of systematic movements, and resistant exercises. Weariness must be carefully avoided.
2. Mildly active—such as dancing, swinging, bicycling and golfing.
3. Active sports—racing and tennis are only allowable in the fully compensated heart.

### The Innervation of the Heart

The heart is supplied through the vagus, the inferior and superficial cardiac nerves and branches from the superior, middle and inferior cervical ganglia. The superficial cardiac plexus is located in the hollow of the arch of the aorta giving off branches to supply



the pericardium, the right coronary and the pulmonic plexus. The deep plexus is situated behind the arch of the aorta and is much larger than the superficial. It sends a branch to the left and right coronary plexuses.

The cardiac nerves follow the furrow of the heart where they pass into the auricle forming the small ganglion known as the sino-auricular node. Other nerves continue into the auricular-ventricular bundle and are known as the Bundle of His. Located on this bundle there is a node which is often called the Node of Tawara. From this point the nerve supply is given off to the ventricles. It is the latter bundle that is involved in altered rhythm, strength and rate of the heart.

Quoting from McConnell, *Journal of Osteopathy*, December, 1919, "Osteopathic Lesions Effecting the Heart". "I find the most common Lesions affecting the heart embrace the upper four dorsals, vertebrae and ribs; occasionally the lesion is as low as the fifth; the second and third segments are more often lesioned. It does seem that in a number of instances the mal-adjusted rib or ribs especially on the left side are lesions immediately at fault insofar as the heart distribution is concerned, for even a slight change here in position of the rib lesion will greatly influence the heart. Thus in most cases of rib mal-adjustment the alignment of the corresponding vertebrae is faulty, usually some combination of rotation and side bending with slight kyphosis".

The upper dorsal supply readily reaches the heart through the stellate, middle and inferior cervical ganglia.

"It is a fundamental osteopathic tenet that the compromise of nervous integrity is certain to disturb function, which if maintained will through various and varied graduations lead to organic involvement."

Reflex disturbances are often the basis for lesions following muscular imbalance, which in turn disturb nervous equilibrium of the vital circulation. Lesions of the second cervical affect the vagus nerves. Lesions of the lower cervical vertebrae exert their influence by way of the cervical sympathetic ganglia and related centers. The fifth dorsal segment without doubt affects the nutrition of the body, and in the child responds notably to treatment.

Bear in mind the diaphragm and the lower ribs on account of their influence upon respiration and the portal circulation.

While valves that have been diseased cannot be remedied, the compensation may be restored and maintained. It has been our pleasure to see case after case of valvular leak, as well as myocarditis and dilated heart, respond to proper corrective osteopathic procedure. It is our duty to bring compensation to the highest state of efficiency.

The child's recuperative powers often being better than in the adult, local treatment over the chest is of value,—spring the ribs, one hand posteriorly and the other anteriorly, make and break gently. Give especial attention to the upper six ribs particularly on the left side.

Particular attention should be paid to the portal circulation by local treatment, bearing in mind the nerve centers from the tenth dorsal to the second lumbar. The portal circulation has its influence on the right side of the heart.

When treating children keep in mind the character of the osseous structure. In the child's spine there must necessarily exist an immature development, and it does not seem advisable to use the same methods in forcibly correcting structure as are used in the adult. Forced reduction is not indicated but rather a process of gradual stretching, separating the joints and giving them the normal range of motion.

### DISEASES OF THE BLOOD VESSELS

**Malformations** of the blood vessels are rarely found, apart from malformations of the heart. The condition is fatal if of more than the slightest degree.

**Coarctation of the arch of the aorta** is a constriction or occlusion of the aorta near the site of the ductus arteriosus. In such cases the ductus arteriosus remains open, and collateral circulation by way of the upper intercostal and mammary arteries, and the lower intercostal and epigastric arteries, provides more or less completely for the needs of the body. Death is apt to occur, though cases have been reported in which this deformity has existed through a long and apparently normal lifetime.

**Arterial hypoplasia** consists in defective development of the aorta and the larger arteries. This diminished size may be slight, in which case life is fairly comfortable and normally prolonged, or very marked, in which case death is speedy and inevitable.

**Thrombosis and embolism** are rare; their occurrence is due to marasmus, infections, and trauma. Rarely embolism from the umbilical veins causes serious effects.

**Arteriosclerosis, atheroma, aortitis, arteritis, aneurysms**, all are rarely found in children, and are of the same etiology, prognosis and treatment as in adults.

**Dilatations** of the arteries, capillaries or veins are present in nevi, q.v.

**Raynaud's Disease** is rare in childhood; it does not differ from the disease as found in adults.

**Chillblains** are common in children in cold climates, who are improperly dressed. This is discussed in connection with Diseases of the Skin (q.v.)

## PART V. DISEASES OF METABOLISM AND THE INTERNAL SECRETIONS

### CHAPTER XXXVIII

#### Introduction

By W. Curtis Brigham, D. O.

The subject of Endocrinology and Endocrinopathy is at the present time little understood. However, some advance has been made in the isolation and therapeutic use of endocrines. The active principle of thyroid has been isolated and may be made synthetically, as also the active principle of the suprarenal capsule.

Extracts from pituitary body, ovary, spleen, testes, thyroid, suprarenals, and other glands of internal secretion are being used by many. The relations existing between these glands and their secretions is still a subject of investigation. Glands that furnish internal secretions during embryonic life and early childhood may atrophy to some extent before the beginning of adult life. Other glands develop and furnish new and important internal secretions, which may continue for many years and then practically cease their activities.

It is a biological principle that all tissues which remain active have catabolic products that differ in their chemistry, as well as in their physiological activities. These catabolic products find their way ultimately into the body fluids and tend to modify the physiological activities of other organs of the body. For instance, in the presence of concentration of  $\text{CO}_2$ , the respiratory activity is hastened, and so with the cardiac activity, for the time, at least.

It would seem, then, that the catabolic product of one organ or tissue may act as a stimulus to the functional activity of other organs or tissues. If we could thoroughly understand the effect of the catabolic products, of muscle catabolism, on each and every organ of the body; if we had a thorough understanding of the effect of the catabolic products from the kidneys on every other organ of the body, likewise the liver, intestine, the lymphatic glands, the brain substance itself, undoubtedly many perplexing problems would be solved.

The common clearing-house of all these substances is the blood stream. There we find not only the foods for the maintenance of the nutrition but also the catabolic products and the internal secretions of each and every organ of the body, and it seems not too much to presume that even those things which we consider poisonous and absolute waste material, after they are excreted, may in the blood

stream be of vital importance in the maintenance of the well-being of the normal body.

Every organ of the body, during a state of health, has a considerable reserve. For instance, the lungs are able to do work in excess of what they are ordinarily required to do. The heart, likewise, is capable of doing many times the amount of work that is ordinarily required of it. The skeletal muscles of the body are able to meet great excesses in physical demands. However, no matter how perfect the heart is in itself, it cannot do work in excess of the reserve existing in the lungs, and the skeletal muscles cannot do work that would demand a cardiac reserve in excess of the reserve actually existing in that organ. As a practical mechanical illustration we may say that no matter how powerful an engine you have in an automobile, that engine cannot deliver power to exceed the strain and stress which the wheels and chassis are able to bear without destruction of the machine. The law which applies to physics from this mechanical viewpoint also applies to physiological physics. If there is a reserve in the heart, lungs, liver, kidneys and other organs of the body, we would expect to find also a reserve nicely balanced in the blood stream of the healthy individual and this reasoning has led to the therapeutic use of normal blood, administered intramuscularly, in cases where other measures have failed.

As long as there is life there must be nearly enough of these internal secretions to maintain life, even though the patient is failing, and it is not difficult to imagine that a patient who lacks only a small fraction of one percent to maintain a balance, although maintaining a state of absolute quiet, will gradually lose out. If this small fraction of one percent can be supplied by the administration of five, ten, fifteen or twenty-five cubic centimeters of normal blood, in which there is a reserve of all essentials for maintaining a balance, it would seem logical to use this method and it has been employed with success in cases of anuria, hemorrhage, severe toxemia, Addison's disease, various anemias and acute infections.

For small children we have used one or two cubic centimeters of normal blood very successfully. With adults the dose ranges from five to fifteen cubic centimeters, which may be repeated in acute cases two or three times daily, while in chronic cases probably two or three times a week is sufficiently often. In many cases response is so prompt that one dose is enough, while in some cases of severe anemia we have administered as many as thirty or forty doses to one patient.

#### Technic of Blood Injection

The instruments required for this operation are few and simple. A ten c. c. Luer syringe, and a 19 or 20 gauge needle will suffice. The donor should be a healthy individual whose coagulation time and red and white cell count are normal. Syphilis and other constitutional diseases should be excluded. The syringe and needles should be sterilized by boiling.



**Steps in the Technic**

1. Have an assistant grasp the arm of the donor well above the elbow.
2. Prepare the ante-cubital space over the median basilic vein with iodine and alcohol.
3. Have the assistant apply sufficient pressure to prevent the venous, but not the arterial flow of blood, through the arm.
4. Have the patient open and close the hand vigorously a few times in order to distend the superficial veins.
5. Plunge the needle through the skin and into the vein. With a little practice, one can readily tell when the needle enters the vein, both from the sense of touch and the appearance of blood in the syringe.
6. Slowly withdraw the plunger, allowing the blood to follow back until the desired quantity of blood has been obtained.
7. Instruct the assistant to release the pressure on the arm, and apply a piece of sterile gauze, saturated with alcohol, over the needle where it pierces the skin.
8. Withdraw the needle, and inject blood into recipient in area previously painted with iodine. Be sure to get blood into muscle.
9. After the blood has been injected, apply hot packs over the area for five to fifteen minutes.

## CHAPTER XXXIX

### DISEASES OF THE THYROID GLAND

The thyroid gland receives its vaso-motor and its secretory control from the third to the fifth thoracic spinal segments. The white fibers from these segments enter the lateral chain of sympathetic ganglia and pass upward to the middle cervical ganglion, where they terminate, for the most part, by entering into the formation of the pericellular baskets. A part of the fibers terminate in neighboring ganglia. Gray fibers, axons of the cells of the sympathetic ganglia, pass to the thyroid, and terminate upon its blood vessels and branch among its glandular epithelium.

Vertebral lesions cause edema around the lesioned areas. The pressure and the chemical changes of the tissue fluids disturb the functions of the nerves, ganglia and other tissues in the edematous area. Hence, lesions of the upper thoracic vertebra, or of the third to the seventh cervical, may affect the sympathetic ganglia and the nerve fibers which control the thyroid gland.

These relations must be kept in mind in the treatment of diseases of the thyroid.

### CONGESTION OF THE THYROID

The thyroid gland is subject to marked variations in its blood supply, especially in females. Hyperemia in a slight degree is rather common as the result of any emotional excitement. This rarely reaches such an extent that the swelling of the gland is recognizable, in normal children. Children who have bony lesions of the third cervical, the sixth cervical or second thoracic vertebra, or in whom the size of the thoracic inlet is diminished by rib lesions, or by any other structural change, show hyperemia of the thyroid upon comparatively slight provocation.

The onset of menstruation in girls is often antedated by rather marked congestion of the thyroid and, since this time of life is often associated with nervous disturbances and cardiac irregularities, an erroneous diagnosis of exophthalmic goiter is made. High collars, long fits of crying, any of the acute infectious diseases and, occasionally, attacks of severe coughing may cause temporary congestion and enlargement of the thyroid gland.

If bony lesions are found upon examination, these should be corrected. If the child is intensely emotional, he should be protected from excitement and from the conditions which are known to initiate emotional storms. As a general thing, the hyperemia disappears without particular attention, but the conditions which result from repeated attacks of the hyperemia, or which perpetuate the hyperemia, may ultimately result in the development of a pathological state of the thyroid gland.

### THYROIDITIS

This is a very rare affection in children, as it is also in adults. Any infectious disease or any trauma of the thyroid gland may result in the acute inflammation; the gland becomes swollen, tender and sometimes very painful. The muscles of the neck are very stiff and movement of the head is difficult and painful. Swallowing also is painful and an erroneous diagnosis of post-pharyngeal abscess may be made. Constitutional symptoms are usually mild; slight fever and slight malaise may be present. If suppuration does not occur the condition usually subsides without treatment in three or four days. If the inflammatory condition goes on to the formation of localized pus, the gland may be completely destroyed. Usually the inflammation involves only one lobe of the gland, or it involves most severely only one lobe of the gland.

Before the abscess becomes localized the treatment includes the application of heat or cold to the neck, the very gentle relaxation of the posterior cervical muscles, especially, and such other treatment as is indicated for the better drainage of the inflamed tissues. If the pus can be localized the abscess should be incised and drained; after this the application of an ice-bag or of dry heat for the relief of the pain is indicated.

### GOITER

Endemic goiter occurs in children living in certain districts. The children in goitrous families are especially subject to goiter and also to cretinism. In the children of a goitrous mother, goiter may be present at birth and occasionally the goiter may be so large as to interfere with birth. Rather more often the goiter appears during the first year of life. There seems to be some reason for supposing that the quality of the drinking water is important in etiology.

**The tissue change** in the thyroid is that of the follicular or cystic type most commonly, although colloid and fibroid goiters are occasionally found. The para-thyroids are often affected with the thyroid in the pathological changes and it is very often true that an enlarged thymus is present.

The goiter may be associated with diminished function of the thyroid, in which case the symptoms of cretinism or myxedema are found. Occasionally the goiter does not modify the internal secretions of the thyroid and the metabolism of the child, except for the pressure conditions, remains normal. A very small amount of normal thyroid tissue is able to perform all required functions, hence a considerable amount of the gland can be destroyed without producing any serious constitutional changes.

**The symptoms** due to the goiter are chiefly respiratory. Pressure upon the trachea often causes dyspnea and noisy respiration. Any cause of hyperemia of the thyroid may result in speedy and serious or fatal enlargement of the gland. The goiter itself may exert pres-

sure upon the veins of the neck, thus causing vertigo and headache, or it may affect the vagus nerve by pressure and thus cause asthma, cardiac irregularities and related disturbances. The trachea may be softened by the pressure. Pulmonary edema, broncho-pneumonia and dilatation of the heart are rather common complications.

Sporadic goiter is rare in children. It may occur in any location. Girls are more often affected than boys. The cause, aside from bony lesions, is not known.

Treatment of goiter depends upon the nature of the case. The bony lesions, usually of the third cervical and the second or third thoracic vertebra, with the corresponding ribs, must be corrected. They may recur, but every attempt must be made to establish normal structural relations.

Change of air is often advantageous; the sea shore is usually best. Distilled water or water from other localities should be used exclusively for drinking and for cooking.

Children who show symptoms of thyroid inefficiency should be given thyroid extract, varying according to the demands of each child. This is the powdered dry thyroid of some animal, usually the sheep. One one-fourth grain tablet should be given each day for two or three days and the effect watched. If tachycardia, increased perspiration, diarrhea or other signs of hyperthyroidism appear, the use of thyroid extract should be discontinued. If these symptoms do not appear the tablets may be increased until the metabolism of the child seems normal. Usually three to five grains per day, taken in two doses, are enough to give the best results.

If the pressure conditions reach a danger point, surgical intervention becomes necessary. The surgeon must decide which of the several different operations are advisable in each case,—removal of part of the gland, successive tying of the thyroid arteries, and others.

**Prognosis.** Life does not seem to be greatly affected by the presence of goiters in goitrous districts, though subjects of goiter are not so strong as are normal individuals. In sporadic cases, the goiter often disappears at puberty. In either form, the ophthalmic form, or myxedema, or serious pressure symptoms, may occur at any time.

### EXOPHTHALMIC GOITER

#### (Graves' Disease, Basedow's Disease, Hyperthyroidism)

This disease is rare in childhood although it has been found in the new born baby. Parents who have simple or exophthalmic goiter, or those who are distinctly neurotic, have been found in every case of exophthalmic goiter in infancy. The influence of an alcoholic heredity is fairly well established. Girls suffer more frequently. Occasionally a very severe fright or grief, or a blow upon the head with wrenching of the neck precedes the development of exophthalmic goiter.



Not only is the gland enlarged as the result of congestion and edema, but there is also marked hyperplasia of the secreting cells. The goiter itself is rarely large and may not change the shape of the neck in any recognizable manner. In children persistent or enlarged thymus and sometimes enlarged spleen are associated with exophthalmic goiter.

**The symptoms** are those of the same condition as found in adults. The thyroid is slightly enlarged and pulsation is distinctly felt. Exophthalmus may be very slight and is usually less marked than in adults. Tremor is rather rare in children, but coarse movements resembling those in chorea are rather common; the heart is usually dilated; anemic murmurs are present; vomiting and diarrhea, dyspnea and headache are almost invariable.

Stellwag's sign and von Graefe's sign are rather less common in children than in adults. Cutaneous symptoms include increased perspiration, various flushings, occasionally pigmentation and, rather rarely, roughening of the skin and mild eczematous eruptions. Restlessness, and insomnia with alternating irritability and depression are usually present, although abnormal mental states are rather less marked in children than in adults.

Many of these cases are incomplete or aborted; slight restlessness, slight tachycardia and a staring expression of the eyes are symptoms of these milder cases. The diagnosis of hyperthyroidism may be most definitely settled by the determination of the basal metabolism. The metabolic rate thus determined is invariably considerably increased in every case of increased activity of the thyroid gland.

**Treatment** is somewhat difficult. The correction of such structural abnormalities as may be found upon examination occasionally results in a rather spectacular recovery; in other cases the most careful treatment results in no good effects whatever. Rest, preferably in bed and in the open air, is important. Exertion and excitement must be carefully avoided. Cold compresses over the neck and an ice bag over the heart sometimes give relief when the cardiac action or nervous excitability are marked. Meat and meat broths must be excluded from the diet. An abundance of fresh vegetables with moderate amounts of carbohydrates and fats, an abundance of milk and enough eggs and cottage-cheese to provide a rather low protein intake are decidedly advantageous foods. Very rarely the removal of a part of the gland or the successive tying of the thyroid arteries may become necessary.

## CRETINISM

### (Myxedema, Athyreosis, Myxidiocy, Hypothyroidism)

Cretinism is an abnormal condition occurring early in childhood due to the absence of the internal secretion of the thyroid gland.

**Endemic cretinism** is found in the inhabitants of goitrous districts. Cretins often suffer from goiter and in these cases the internal secretion of the thyroid gland is absent. The children of parents who suffer from simple or exophthalmic goiter may be cretins or may be normal. It is rare that more than one cretin is found in a family, although families of cretins have been reported.

**Sporadic cretinism** is rather rare and its cause is not known. There seems to be no basis for inferring a bad heredity and it is probable that the lack of the thyroid gland is due to the same conditions which are responsible for the absence of any other organ of the body or for the occurrence of any physical deformities. These factors have not yet been well studied.

**Congenital myxedema** occurs most commonly in children born of a goitrous mother; the condition is rare.

**Infantile myxedema** is much more common and the ordinary form of cretinism is of this type. The child seems to be normal at birth and for a few months afterward. Probably the internal secretion of the mother's thyroid gland provides for the metabolic needs of the baby for a certain length of time after birth. The mother may not be very acute in observing slight departures from the normal and the child is often brought to a physician for treatment when the cretinoid symptoms have become extremely well developed.

**Juvenile myxedema** occurs after the age of two and before puberty. In this condition the thyroid gland, which may have been somewhat deficient or may have been normal at birth, has suffered injury as the result of trauma or disease.

**Tissue changes** involve almost the entire body. The thyroid gland is either completely absent or has been destroyed as the result of trauma or disease. The liver, spleen and thymus may be enlarged; the thymus may share in the atrophy of the thyroid and para-thyroids, may also be absent, or may show evidences of compensatory hypertrophy. The skin and mucous membranes are very much thickened; a peculiar gelatinoid substance whose nature is not yet well understood is deposited in the subcutaneous and submucous tissues. The bones show very marked modifications; the centers of ossification are very late in appearing and the bones develop very slowly and in a somewhat irregular manner. The long bones fail to attain proper length and the short arms and legs of the cretin are distinctive. The pituitary body and the pineal gland are often hypertrophied. The palpebral fissure is narrow; the forehead is low and receding; the hair is thick, harsh and rough; the tongue is too large for the mouth and often hangs from between the very thick lips; the teeth appear late and decay early; the nasal alae are much thickened. The fontanelles remain open for a long time, sometimes even to adult life; the appearance of the child indicates very definitely the deficient mentality. The sexual organs do not become developed and may be of the infantile type until adult life is reached.

**The symptoms** are alike in all of these forms and differ only in degree and in the time of onset. In the average case the symptoms are noticed at about the age of six months, the time varying somewhat according to the critical watchfulness of the nurse or mother. It is usually first noted that the child fails to pay attention to its surroundings as normal children do, and that it does not begin to sit up or to walk, or does not develop its teeth in the normal manner. The arms and legs are too short for the length of the body; the skin is thick and rough and appears edematous, but it does not pit upon pressure; the eye-lids are swollen and usually rather drooping. The abdomen is protuberant and the spinal column shows lordosis in children of four or five years or more.

X-ray examinations of the hands, feet or limbs show characteristic absence or retarding of the centers of ossification in the long bones and in the epiphyses. The mental state is that of almost complete idiocy; the child pays very little attention to his surroundings but usually howls rather terribly when hungry or uncomfortable.

In milder cases the myxedema may be slight and the skin only somewhat thickened and dry; the hair is usually very coarse, even in rather mild cases; mental retardation may be slight or marked, according to the degree of severity of the disease.

The diagnosis is usually easy; in mild cases the disorder may be confused with rickets, achondroplasia or infantilism. A little careful observation is usually sufficient to distinguish between these various abnormalities and in the final test the results secured by the administration of thyroid gland make the diagnosis sure.

**Treatment.** Since the disorder is due to the absence or complete atrophy of the thyroid gland the treatment is usually very easy; the thyroid gland of some animal should be administered and this may be done in several different ways. The fresh gland of some animal may be given; this may be slightly seared on both sides, but if it is thoroughly cooked the properties of the gland are destroyed. This method is sometimes efficacious when the administration of the dried gland fails. It is difficult to secure the fresh gland as often as is necessary, and the child may refuse to eat a sufficient quantity of it. The most convenient and usually the most efficacious method of administering the thyroid is by means of the thyroid tablets. These are made of the dried and powdered thyroid gland, usually of the sheep. For three to five days one one-quarter grain tablet should be given once each day. After this two one-quarter grain tablets should be given each day and within the first month the daily dosage should be increased to about five grains each day, and this is best given in two or three doses. If at any time the child should show symptoms of hyperthyroidism, such as tachycardia, insomnia, increased perspiration, diarrhea, the thyroid should be omitted for one day and after that should be administered in somewhat diminished doses. Usually about five grains a day with an occasional two days rest

represents the normal secretion of the normal thyroid gland. The administration of the gland must be continued throughout the life-time of the child. The different preparations vary in usefulness, and if one make of tablets fails to give good results, another should be selected.

Although the logical treatment is the administration of the thyroid gland which the child definitely lacks, there seems no doubt that osteopathic treatment adds greatly to the rapidity of recovery and increases the extent to which the child nears normal mentality. On examination, these children show definite vertebral lesions, as well as the customary lordosis. Correction of the lesions and the maintenance of correct structural relations, of soft tissues as well as of the skeleton, provides the best possible conditions for recovery. The circulation and innervation of all parts of the body being as nearly normal as possible, the presence of the normal thyroid secretion, provided by the administration of the gland of animals, is enabled to act speedily and efficiently upon all tissues of the body.

**Prognosis.** The marked improvement following the administration of the thyroid gland in these cases is very spectacular. A child who has seemed to be an absolute idiot may, within one month, be talking, learning to walk and may be developing good habits of eating and earning for himself. The myxedema disappears within a few months, the bones begin to develop and the entire condition undergoes rather rapid and marked improvement. The earlier the disease is recognized and the thyroid extract administered, the more marked is the improvement. The child naturally can not be expected ever to attain normal mentality, although his physical condition may approach the normal. If the administration of the thyroid does not cause improvement within a very few weeks it is very probable that an erroneous diagnosis has been made and that some other form of defect is present.

#### Other Disorders of the Thyroid

Goiters are often associated with cysts, and cysts may occur in the thyroid gland without any recognizable enlargement. These are usually developmental in form. Tumors of the thyroid are very rare at any time of life, especially in children, but sarcoma and carcinoma are occasionally present. Tuberculosis of the thyroid is present only in advanced stages of the generalized infection. Hereditary syphilis is occasionally associated with gummata of the thyroid and these may be so large as to produce marked goiter.

#### Diseases of the Para-Thyroid Glands

From one to four para-thyroid glands are present in the normal child. These are attached to the lateral lobes of the thyroid, upon the posterior aspect, or may be found lying in the immediate vicinity of this area. Their function is not definitely known, but their internal secretion seems to be essential to normal calcium metabolism. Their accidental injury during the thyroid operation



or their experimental extirpation in animals is usually followed by marked disturbances in the calcium metabolism and by the development of tetany. (See Tetany). It occasionally happens that these glands are destroyed by hemorrhage, when disturbances of the calcium metabolism and tetany result.

**Treatment** of these conditions by the use of para-thyroid extracts has, so far, been very unsatisfactory. In any case in which the para-thyroids appear to be deficient an attempt should be made to find some satisfactory way of administering para-thyroid extract.

## CHAPTER XL

### DISEASES OF THE ADRENAL AND OTHER INTERNAL SECRETIONS

The adrenals receive their vaso-motor and secretory control from the eleventh and twelfth thoracic spinal segments. The associated sympathetic ganglia and the ganglia of the solar plexus carry the nerve impulses concerned. It is evident that lesions of the related vertebra, or various abnormal conditions affecting the solar plexus, may affect the adrenals as well as the kidneys.

The adrenal glands are very vascular and very soft; hence they are subject to hemorrhages during difficult birth, or in the presence of any hemorrhagic disease, or of any of the acute infections which are characterized by tendencies to spontaneous hemorrhages.

In all diseases of the adrenals, the symptoms are vague and indefinite; the diagnosis is rarely made, in children, before death.

#### ADDISON'S DISEASE .

This is a disease of the suprarenals, usually tubercular, and associated with a diminution or absence of the internal secretion of the suprarenal glands. The disease is rare at any age and it is especially rare in childhood. It may be associated with tuberculosis in other parts of the body. The semilunar ganglion and the solar plexus are often found diseased in these cases.

Lesions of the eleventh and twelfth thoracic are commonly present. The early symptoms are indefinite. Weakness, anorexia, vomiting, diarrhea and a moderate secondary anemia are the first symptoms. Later, dizziness, convulsions, headache and vague abdominal pains are noted. The pigmentation of the skin may be found early in the disorder, or this may not occur until the disease is well established. This pigmentation is of a peculiar bronze tint, varying from that almost unnoticeable to a very dark, almost black, tinting or coloring. The color is first seen in the areas exposed to the light, the face and hands, and soon involves the skin of the folds, especially the flexor surfaces, genitals, umbilicus and arm-pits. The spots spread and may involve the mucous membranes. Occasionally no pigmentation occurs anywhere.

The progress of the disease is usually rapid in children. Intermissions occasionally occur. Sometimes within two months, or usually within two years, increasing weakness leads to death. Syncope and convulsions may occur toward the end.

**Treatment** is of little avail. The usual methods employed in tuberculosis are indicated, including corrections of the lesions as found. The suprarenal gland may be administered; extracts may be purchased which are easily taken. If these give no relief the

fresh gland may be secured from the slaughter house, sliced and very slightly seared upon the surface; this may be seasoned in any way the child likes and fed to him.

Dr. Brigham reports a recovery following infusions of normal blood, using the technique which he describes in the Introduction.

**The prognosis** is very gloomy. Death is to be expected, although every effort should be made to stop the progress of the disease and to develop the functional activity of any remaining adrenal substance.

#### Tumors of the Adrenals

Tumors of the adrenals are very rare in childhood, and include adenoma, carcinoma, sarcoma, dermoids and hypernephroma. The sarcoma is especially prone to metastasis. Lymphosarcoma may be associated with similar pathology elsewhere. The bone, liver and brain are favorite sites of metastasis in these sarcomas.

Hypernephroma is a rare tumor at any time of life, and especially during childhood. During early life it produces very peculiar symptoms, and is of interest for this reason. Boys are more often affected than girls. The sexual characteristics develop very rapidly and this is associated with overgrowth of the entire body. When girls are affected they do not show increased femininity, but tend rather to develop masculine characteristics. The clitoris may enlarge to such an extent that the sex of the child seems doubtful.

In one group the entire skeleton, muscles and sex organs undergo remarkably rapid development. Boys alone are found in this group. In another group of cases the most characteristic change is obesity; the fat is most abundantly deposited over the trunk, cheeks and neck. A few girls are so affected.

The differential diagnosis between this disease and the various developmental defects due to diseases of the pituitary body, the pineal gland and other similar conditions may be very difficult before death.

No treatment is successful. Death is to be expected before puberty, if not in early childhood.

#### Diseases of the Pituitary Body

The pituitary body is a glandular structure which rests in the sella turcica. It is a complicated structure and seems to include two or more very different internal secretions. The secretion of the anterior lobe is essential to normal growth of the body and the relative development of its parts. The secretion of the posterior lobe is essential to normal carbohydrate and hydrocarbon metabolism and also to the normal secretion of urine. The nature of the diseases associated with disturbances of the pituitary body suggest that the functions of this gland are even more complicated than is indicated by the statements just made.

**Acromegaly (Gigantism):** Abnormal increase in the size of the body has long been recognized. Giants have been described for all ages. Hyperplasia of the pituitary body and especially of its anterior lobe has been found in a very considerable proportion of these cases. The increase in the length of the bones due to hyperpituitarism occurring before ossification is complete seems to be responsible for the great increase in the size of the skeleton of giants. When the same abnormal condition occurs after ossification is complete, an overgrowth of the bony structures in a freakish and unbalanced manner causes the deformity recognized in later life as acromegaly. In these cases the pituitary body may show a tumor, usually a fibroid or myxomatous.

**Hypopituitarism** (Frohlich's syndrome, dystrophia adipositis genitalis). This condition has been supposed to be due to a deficient secretion of the anterior

lobe of the pituitary body, but it may be that there is rather a disturbance in the quality of the secretion than in its quantity. The relation between the internal secretions of the pituitary body, the pineal gland, the suprarenal glands and the reproductive glands is probably very much more complicated than is at present recognized. This disease is always associated with a disturbance of function of the pituitary body and probably also with a disturbance of other internal secretions. Headache, bitemporal hemianopsia, occasionally exophthalmus and imperfect development of the sexual organs, are the most common characteristics of the disorder. Obesity is invariably extreme, the fat rather generally placed, although the limbs are often less obese than is the trunk. Polyuria and an unusual tolerance for carbohydrates are common. The temperature is usually two degrees or so below normal. There is little strength of muscle and the mental development rarely exceeds that of a high grade imbecile. The sex organs do not exceed the development usually present at the age of five or six years.

**Treatment** of these disorders has so far been unsuccessful. The location of the tumor renders surgical interference very difficult, although a few cases in which marked improvement in the condition followed the extirpation of the tumor have been recorded. The administration of pituitary extracts has, in a very few cases, been followed by some relief of the symptoms. Probably in such a case as this polyglandular extracts might be tried, although cases of improvement under this treatment have not yet been reported.

#### Diseases of the Pineal Gland

The pineal gland is a structure of most interesting phylogenetic development; it seems probable that it is the rudiment of an ancient eye, such as remains somewhat functional in certain reptiles. In mammals it has developed certain glandular functions and these seem to be necessary to normal development, especially of the sex organs. In normal children it undergoes atrophy at about the age of puberty. The diseases of the pineal body are most commonly due to the development of tumors, especially teratoma. Boys are most commonly affected, and between the ages of four and eight.

The symptoms are those of cerebral tumors, such as drowsiness, headache and mental apathy. There is an unusual growth of hair over the pubis and in the axillae. Sometimes the penis undergoes a remarkable increase in length and adult sexual characteristics appear. Obesity is rather common and the fat is deposited most abundantly around the abdomen and over the hips.

The voice passes through the changes usual at puberty, usually. In some cases the voice remains unchanged. Mental precocity is common, but as the disease progresses mentality deteriorates. With the development of the tumor, in the ordinary case, stupor and coma precede death for a variable period,—sometimes for several weeks.

#### GENERAL DISORDERS OF THE INTERNAL SECRETIONS

In some cases general disturbances of nutrition and development are found which seem to be due to disorders either of several of the glands of internal secretion, or of some function not yet well understood. The pineal gland, the suprarenal glands, the thyroid gland, the pituitary body, the ovaries, the testes, the pancreas and perhaps certain other organs of the body whose functions are not yet well understood, seem to exert an influence upon one another and upon the development of the body as a whole. Disturbances not only of the glands themselves, but of their relationships, one with another, result in peculiar disorders of development.



### Infantilism

The persistence of infantile characteristics seems to be due to a considerable number of etiological factors. Cases of this disorder may be classified into two great groups: the essential group, in which there seems to be merely a freak of development; and the symptomatic group, in which the infantilism is due to disturbances of some function of the body.

**Ateleiosis:** This is an arrest of development occurring in infancy and associated with the persistence of the infantile shape of the body and usually with other infantile characteristics. In the asexual type the infantile characteristics involve the sexual organs and, although the child may live to be thirty years old or more, the sexual organs do not mature, and the general appearance is that of a child. In the sexual type the changes of puberty occur naturally, the skeleton becomes ossified and the patient becomes a miniature man or a woman. Professional dwarfs, such as Tom Thumb and his wife and others are of this type. These may or may not be normally intelligent.

**Progeria:** This is premature old age, and it is very rare. Infantilism passes into senility. Emaciation, wrinkling, baldness or white hair, arterio-sclerosis, and the bowed head and curved back of extreme old age occur in the child who is not yet ready for adolescence. Death is to be expected before the age of twelve years.

**Symptomatic infantilism:** Several types are recognized. The **Lorain Type** is characterized by the occurrence of small size with the proportions of a tiny adult. The general health is usually poor, the intellect is frequently retarded, but may be normal. This condition is due to any severe cause of mal-nutrition such as hereditary syphilis, malaria, tuberculosis, diseases of the heart, hypoplasia of the blood-vessels, or it may be due to some poisons, such as tobacco, alcohol, opiates or lead. These poisons have occasionally been administered to children in order to retard their development.

**The Brissaud Type** is characterized by some of the symptoms of hypothyroidism and it now seems probable that these children are really atypical cretins. The trunk is large, there is a tendency to obesity; the abdomen is prominent; the sexual organs are undeveloped and mentality is usually very low. The administration of thyroid extract sometimes brings about improvement both of the Brissaud and the Lorain types of infantilism.

Intestinal infantilism, pancreatic infantilism, pituitary infantilism and the form of infantilism associated with status lymphaticus have been discussed in other sections.

### Obesity

**Etiology:** It is probable that most cases of obesity in children, as in grown people, are due to the fact that the intake of food is

greater than its oxidation. Cases in which the obesity results in definite deformity probably never result from dietetic indiscretions. Some of these abnormal children attain remarkable weights. Reports have been made of an eight months' child which weighed forty pounds; of a child of thirteen years which weighed two hundred and fourteen pounds; and other cases of about equal mark have been reported.

The causes include many factors; heredity is an uncommon factor in children. A diet too rich in fat is especially apt to result in moderate obesity. The obesity associated with cretinism and disturbances of the various internal secretions have been discussed elsewhere. Surgical operations which destroy or injure the testes or the ovaries are usually followed by a persistent obesity. In children the fat is usually deposited in a more uniform manner than is the case with adults.

The face is usually round, the trunk is usually affected evenly; the breasts are usually large in both sexes; the arms and legs usually share in the deposit of the fat.

**Treatment** is usually difficult but successful. The obesity due to the disturbances of the internal secretions may present marked difficulties. The fat and the carbohydrates of the food must be diminished. The diet for children who are more than eight months in age should include the purees of green vegetables in abundance. As the child grows older fruits and vegetables, especially raw vegetables, should be given in great abundance. It is necessary to exercise considerable care in limiting the carbohydrate intake of small children lest acidosis should develop. The internal secretions or thyroid extract should never be administered unless there seems to be reason for supposing that these secretions are deficient in the patient.

### Precocity

Rather rarely development of a child is hastened instead of being prolonged as in the case of infantilism. In little girls menstruation may begin at the age of five years and persist until death. Growth may proceed with rather remarkable speed, while apparently following a normal course. Pregnancy has been known to occur at the age of eight years. In boys five years old the sex characteristics may seem to be those of the normal adult. Mental development may proceed as rapidly as does the physical. Sometimes the mental development is retarded.

At autopsy various tumors and degenerations may be found affecting the glands of internal secretions, or there may be no recognizable tissue change to account for the remarkable growth.

These children usually die at puberty if they live even so long as this.

### Skeletal Defects

These are not known to be due to disturbances of internal secretions, but the general picture resembles other diseases which seem to be due to these. Hence they are included in this chapter. Both conditions are rare.

Achondroplasia; micromelia chondromalacia; chondrodystrophia. This is a developmental defect beginning in the fetal skeleton. The cartilage between the epiphysis and the diaphysis fails in proper proliferation, and hence the bones fail to attain proper length. Calcification and ossification are not affected; hence the bones become much thicker than normal.

The arms and legs are very short, and the fat skin lies in folds around them.

The nose is saddle-shaped. The head is larger than normal. The gait is odd and waddling.

Mentality is not affected. Court jesters, the dwarfs which have been favorites of the royal courts, and clowns are derived often from these unfortunates.

Osteopsathyrosis; osteogenesis imperfecta. In this condition the ossification fails, while the proliferation of the cartilage is normal. The bones grow very long and thin, but are very weak and may be porous. Hence many fractures occur, both before and after birth. Calluses are abundant and great deformities result in all the limbs. These children die within the first year of life.

## CHAPTER XLI

### VERTEBRAL LESIONS IN DISEASES OF METABOLISM

During birth, especially during difficult labor or as the result of improper obstetrical procedures, lesions of the cervical vertebrae are very apt to be produced. Lesions of the occiput, ribs and upper thoracic spinal region, and lesions of the lumbar region and of the innominates, also occur, though less commonly. After birth, careless handling of the baby may produce lesions which are only the more important because they are produced before the bones are ossified. When the child begins to sit alone, cervical and occipital lesions are frequent. When he begins to walk and to play, falls are common and lesions easily caused. Later in life, falls, wrenches, strains, blows and improper punishments may cause lesions of varying severity.

However produced, every lesion is associated with certain pathological changes. Edema of the tissues neighboring the lesioned area, with disturbance of the circulation of the blood, act adversely upon the nerve trunks and the sympathetic ganglia near the affected vertebrae, and thus interfere with the normal activities of the organs innervated by the nerves or the sympathetic ganglia. It has been shown by animal experimentation as well as by clinical histories, that the organs innervated from the spinal segments near lesioned vertebrae undergo various pathological changes. Circulation becomes disturbed, secretions become modified, active cells show cloudy swelling, and muscle fibers, both nonstriated and striated, lose something of their normal tone. All connective tissues within the area of innervation of the spinal segments affected by lesioned vertebrae become edematous, lose elasticity and strength, and become more extensible than normal.

The ultimate effects produced by these lesions during early life cannot be predicated. Several organs are innervated by nerves from any segment of the cord, and which of these suffers the greater ill from any given lesions depends upon a considerable number of factors,—heredity, environment, exposure to infection, climatic conditions, food, bathing, and other factors which increase or diminish the tendency to disease of various organs.

Lesions of the cervical vertebrae tend to modify the circulation through the brain; children who are “neurotic” or who suffer from the “nervous diathesis” invariably have cervical lesions, and usually have a lesion of the occiput.

Lesions of the lower cervical and upper thoracic vertebrae interfere with the circulation through the mucous membranes of the upper respiratory tract, and the tissues of the neck. Children with



such lesions tend to repeated or chronic inflammations of the mucous membranes of the nose, throat and upper bronchial tubes,—they are said to have an “exudative diathesis”. Lesions of the upper thoracic region, especially the third and fourth thoracic vertebrae, tend to interfere with the action of the heart. A slight venous congestion results, which may be unrecognizable, but which affects the spleen, liver, thymus, and neighboring lymph nodes. Such a child is said to have a “lymphatic diathesis”.

It is true that children may inherit tendencies; it is also true that they inherit structural arrangements. Since these structural conditions often cause imperfect activities of the various organs of the body, we may consider the diatheses to be at least partially hereditary.

The use of the term “diathesis” is a confession of ignorance, and more rational methods of treating children must result from a constant effort to find some definite etiological factor for the symptoms noted in every child supposed to suffer from a diathetic tendency.

The deficiency diseases unquestionably have at their etiological root an improper diet. Nevertheless, it must be remembered that what is apparently an adequate diet for one child may be entirely inadequate for another. Lesions of the mid-thoracic region exert a detrimental effect upon the digestive tract, especially upon the pancreas, stomach and liver. Given such lesions, a child who has merely an almost adequate diet may suffer seriously, while a child with a body structurally normal might be able to handle the same food without trouble.

Immunity to infection, in general, depends upon normal activity of the lower thoracic spinal centers. These are adversely affected by lesions of the corresponding vertebrae or ribs. Rigidity of the lower thoracic spinal column, or definite lesions of the lower thoracic vertebrae, may so interfere with the activity of these centers as to permit infection by invading bacteria which would otherwise be easily overcome.

The normal secretions of the ductless glands are essential to the maintenance of health. These glands are controlled by the nerve centers, as are other organs of the body. Lesions affecting the nerve centers may thus interfere with the normal activity of the internal secretions, and various disorders of metabolism result.

These various factors must be kept in mind whenever any of the so-called nutritional, or constitutional diseases is under consideration.

## CHAPTER XLII

### DISTURBED NUTRITION

The diseases which are associated with disturbed digestion naturally result in great weakness and marked emaciation. Tuberculosis, diabetes, mellitus, and chronic bronchitis result in noticeable decline in weight and in strength. Long continued digestive disorders are the most common causes of such wasting. However, there seem to be certain children for whom no organic disease is demonstrable, and yet, who seem to be unable to make use of food which is, so far as can be determined, perfectly normal in amount and in proportion.

The cause of this peculiarity and inability to make use of food is not definitely known. Several etiological factors are concerned in most cases, such as faulty hygiene, the lack of fresh air and sunshine, the lack of exercise, the crowding of children in hospitals and orphans' homes, faulty food, a succession of digestive or pulmonary diseases, chronic infectious processes, tubercular or otherwise, and improper diet. The peculiar effects produced in the child by personal attention and interest are not easily explainable, and yet there seems no question that babies which are cared for in a manner which is mechanically perfect, but in which this factor which we ordinarily call personal attention is lacking, fail to make proper gain. Children in orphans' homes, in hospitals, and children who are boarded out for various reasons, often suffer from malnutrition although every recognizable dietetic and hygienic requirement seems to be met.

#### **Marasmus**

(Malnutrition of infants, inanition, infantile atrophy and simple wasting).

Premature babies are especially prone to suffer from inanition. In any case of malnutrition the most thorough examination should be made in order that tuberculous foci, gastro-intestinal disorders, cardiac disorders, deformities of the viscera and chronic pulmonary infections of any kind may be recognized and may receive adequate treatment.

Acute inanition often imitates very serious organic disease. It is far more common in premature babies or in very little babies than in older children.

**Etiology.** This condition is usually associated with feeding improperly adapted to the age and the condition of the child. Very often a baby which has been fed upon inadequate diet seems to be thriving fairly well until some slight modification of its food, or

some excitement, or change of scene, or some acute infectious disease causes a rapid loss of its weight and strength. Weaning is often followed by inanition, especially if the change from breast milk to a mixed diet is made too suddenly.

**Symptoms.** In this acute inanition the baby loses weight rapidly; sometimes the child passes from a condition of apparently fairly good health to serious emaciation, and seems to be almost ready to die from weakness within two or three days; indeed, the child may die within three days from the time of the onset. In the newly born, the temperature may be increased. In other babies, and sometimes in the newly born, the temperature is subnormal, the pulse speedily becomes very weak and rapid and is often irregular. Respiration is shallow and irregular, the urine is scanty but seems otherwise normal in cases uncomplicated with renal diseases. Pallor and cyanosis are common. Symptoms of acidosis are not common in uncomplicated cases. The child seems restless and fretful in the early stages or in mild cases, but after the emaciation becomes marked the baby passes into a semi-stupor or coma which immediately precedes death. The bowels may move frequently, though if true diarrhea is present a gastro-intestinal origin of the disease must be suspected. Stools are about normal in quality but may become very much like meconium when food is completely refused.

**Treatment** is very successful when dietetic errors can be found and corrected. In some cases no treatment at all prevents a fatal outcome. If the disorder was initiated with weaning an immediate return to human milk is necessary; if the child has been receiving an artificial food without any of the vitamin-containing juices, these must be immediately added to the diet. Goats' milk is useful in some cases. Nothing, however, compares with human milk in cases of inanition. If vomiting and severe diarrhea are present, these conditions must be met according to the methods outlined in the chapters on vomiting and diarrhea. Rectal feeding is usually useless.

Definitely localized vertebral lesions are found in about half the cases examined in osteopathic clinics. The correction of these lesions is usually followed by improvement, and this is, if the dietetic and hygienic conditions are satisfactory, permanent.

In other cases no definite lesion can be found, but there is a general rigidity affecting the mid-thoracic region and the thorax. These lesions are constant, and they are apt to recur until the child regains strength. For this reason frequent treatments are required, and these must be repeated until the child is well on the way to recovery.

In many cases more serious symptoms are due to desiccation. Water must be added to the body speedily whenever the wasting is marked. The drip method may be employed for securing absorption from the intestinal tract. In very serious cases intravenous or intra-

sinus injections of normal salt solution or five per cent solution of glucose is necessary in order to secure immediate improvement in babies apparently about to die. The infusion of normal human blood often gives excellent results. The transfusion of blood is sometimes indicated, especially in apparently moribund babies, but the difficulty of typing babies' blood renders the transfusion less desirable except in those cases in which sudden relief is more urgently necessary than avoidance of the risk due to the lack of correct typing.

The maintenance of normal body temperature is very important. Small babies should be wrapped in cotton with a pad of cotton between the thighs, which can be easily removed when soiled; the ordinary dress of the child and the diaper are changed with too great handling. The child should be kept in a warm but thoroughly ventilated room. (The incubator has not fulfilled its early promise for providing a steadfast temperature with the necessary fresh air and humidity in the case of marantic babies).

**Chronic inanition.** The chronic form of inanition is most common in summer and in institutions for the care of children. A certain degree of marasmus is almost universal in children who live in unhealthful surroundings. This condition seems to be a failure of assimilation and not a failure of digestion or of absorption. The child loses weight steadily but not rapidly, if the condition is allowed to proceed unmodified they are reduced almost literally to skin and bone. The abdomen is often prominent and this makes even more conspicuous the wasting of the chest and the limbs. The face resembles that of an old man. The shiny, bright eyes are very noticeable. The hands and feet become claw-like and the skin often lies in wrinkles over the wasted limbs; the temperature may be reduced to 93° F., and a peculiar waxy pallor which may be of a leaden tint is marked.

**Complications** are rather abundant. Although the urine does not show evidences of renal disease the chlorides and other organic salts are greatly diminished, and with this retention of the salts edema is almost inevitable. The tissues of the child become filled with liquid, he looks more plump, the weight increases and the parents are likely to suppose that the child is improving; unfortunately this cheerful outlook is soon terminated by the death of the baby.

Thrush is common and may be sometimes supposed to be responsible for the mal-nutrition. Bed-sores are rather more common upon the back of the head and upon the heels, but may occur over the sacrum.

The resistance of the child to infections is very greatly diminished. Bronchopneumonia often terminates the course of the disease. Spasmodic contractions of the muscles, especially in the neck and



the back are very common, occasionally these may simulate meningitis or spasmophilia.

Sudden death is not rare, especially with the onset of hot weather. Sudden diarrhea may result in a fatal outcome within a few days.

Even small babies may suffer from furuncles, keratomalacia and otitis. The younger the child the more speedy is the fatal outcome.

### Late Malnutrition

**Late malnutrition** occurs in older children and is probably very often tubercular in origin. The normal standard for children of certain ages and certain heights is subject to considerable leeway. Probably a ten per cent loss is always to be considered abnormal. After the child has reached the age of twelve years, probably a greater than ten per cent modification may exist without a suspicion of serious disease.

**Etiology.** A certain number of children are constitutionally weakened as a result of bad heredity; parents who are very old or who have syphilis, tuberculosis, or any nervous instability often have children who are so weak that it seems almost impossible to bring their physical development to that of normal children. It is true also, that the children of such parents are often as healthful and robust as are the children of men and women who are better fitted for parenthood.

Children prematurely born are especially subject, not only to marasmus, in infancy, but also to a weakness in later childhood. After they have passed the age of puberty they are usually as robust as are their normal brothers and sisters.

In another group of cases, malnutrition follows a succession of diseases or the effects produced through a varying period of time during which dietetic or hygienic conditions are abnormal. Children who have bony lesions of the midthoracic region which have been permitted to remain uncorrected, are also subject to malnutrition without other recognizable cause. The unhygienic conditions which result in malnutrition are numerous; usually several factors are concerned in any one case. Children who are allowed to drink tea, coffee or alcoholic drinks, or who eat an excess of bread and sweets, especially those who eat an excess of candy between meals, and who eat little or no fruit or green vegetables are apt to be undersized, underweight and to suffer from other conditions associated with malnutrition.

Excessive work or excessive play, deficient sleep, over-crowding, too little sunshine and fresh air, these also tend to cause malnutrition. Diseased tonsils, decayed teeth and adenoids which interfere with breathing also interfere with proper nutrition.

Very often an autopsy shows that a condition supposed to be that of malnutrition is really that of tuberculosis. Malnutrition is easily recognized, the child may be taller than is normal for his age; he is always thin, usually pale; the hands and feet are usually cold. Young children are late in walking and in talking. The muscles may be so weak that paralysis is suspected. They usually sleep poorly, often suffer from night terrors; are fretful and whining; it is very difficult to give them adequate training on account of their weakness and nervous symptoms. Nervous habits such as nail biting, the chewing of hair, bed wetting and masturbation are common. These conditions are not causative but are the result of the malnutrition.

An unusual amount of precociousness is rather common; these children are sometimes very ambitious and are heartbroken if they do not stand at the head of the class or in the first rank of those engaged in some particular sport. The digestion varies; anorexia is common, constipation may alternate with diarrhea and considerable quantities of mucous may be passed in the stools. They are extremely susceptible to all infectious diseases and contract common diseases of childhood in rapid succession. They suffer from furuncles and are especially prone to repeated attacks of nasopharyngitis. The condition in itself predisposes to tubercular invasion and tuberculosis or pneumonia frequently terminates life.

**Treatment.** The treatment of this malnutrition is usually very difficult. The child's life for twenty-four hours should be very carefully scrutinized. Every article of food should be considered and whatever dietetic errors are found must be immediately corrected. If the child's digestion permits increased amounts of milk and cream and all fresh fruits and vegetables are immediately to be provided. If milk and cream can not be handled other fats must be substituted. Cod-liver oil is often advised, but this seems no better than are other foods which are more palatable. Bacon often provides the fat and increases the appetite. Rich articles of food are often urgently desired but must be refused or limited. It often happens that these children have an appetite for those foods which they especially need; on the other hands there is often an abnormal craving for foods which are particularly harmful to them. Food must be appetizing, but it must also be wholesome and in the outlining of menus from day to day which meet both of these requirements, the skill of the doctor and the nurse or mother is often exhausted.

Any surgical interference which is indicated by the conditions found on examination should be advised, but it must not be expected that the removal of adenoids, circumcision, or any other one of these operations is to be followed by improvement in the nutrition of the child unless hygienic and dietetic conditions also receive proper attention.

Increased mobility of the mid-thoracic region is indicated in all these children. Experiments performed upon "runty" animals show that persistent treatment of the spinal area is invariably followed by increased nutrition. Clinical experience also shows that children who are subnormal in general health, receive great benefit from these treatments.

Most children do better with three meals each day, but occasionally a child thrives remarkably when five regular meals are substituted for the usual three meals each day. Rest is very important; often a child in a quarrelsome family makes immediate and remarkable gain when he is sent to visit at some other home where quarrelsomeness and excitement are not customary. Some children are so fretful that an attempt to keep them resting results in increased nervousness and decreased nutrition. Constipation, diarrhea, vomiting and neurotic tendencies, all of these are to be handled according to the methods outlined in the discussion of these conditions.

### ACIDOSIS

The term is applied to a peculiar symptom-complex in which the alkaline reserve of the body is considerably reduced.

**Etiology.** Children with diminished flexibility of the spinal column, especially marked in the midthoracic region, are most commonly affected by the symptoms of acidosis when other etiological factors are present. The vertebral lesion seems not to act alone in the etiology of acidosis.

Experimentally, acidosis can be caused by the administration of the mineral acids. This probably does not occur in children. Diabetes mellitus, starvation or fasting, and fever are characterized by the presence of aceto-acetic acid, acetone and beta-oxybutyric acid in the blood; these may be found in the urine also. The alkaline reserve of the blood is greatly diminished in such cases. In the acidosis associated with the diarrheas of children the acid bodies just mentioned are not found, or if present at all, are in such small amounts that the symptoms of acidosis cannot be accounted for by their presence. It is possible that lactic acid or the acid phosphates may account for the symptoms in these cases. In diarrhea there may be very serious loss of the alkaline salts as well as of water. Marked acetonuria may be noted without any symptoms of acidosis. It is evident, from these facts, that the condition is not yet understood.

The symptoms of acidosis may be occasionally due to desiccation, with which it is usually, but not always, associated. In desiccation the alkaline salts of the blood may, occasionally, be even higher than in normal blood.

**Diagnosis.** The symptoms include air hunger and hyperpnea, restlessness, insomnia, and variable sweating. Vomiting is com-

mon. In certain children the vomiting may recur frequently, and be the only symptom of a rather chronic subalkalinity of the blood. (See Cyclic vomiting.)

The urine shows normal acidity in most cases. Occasionally either increased acidity, due usually to organic acids, or diminished acidity, due to diminution of the acid phosphates, may be found.

The blood usually is that of mild secondary anemia. In diabetes mellitus and diarrhea the blood may be concentrated. The carbon dioxid combining power is always low. The blood shows diminished alkalinity by any of the ordinary tests.

The respiration is rapid and sometimes irregular. The pulse is rapid and rather weak. The blood pressure may be diminished or increased, according to the cause of the acidosis.

**Treatment.** Prophylaxis is very important. The flexibility of the spinal column should be maintained in treating all the diseases of children. The circulation through the liver and spleen should be kept normal by the usual treatment for that purpose,—raising the ribs, maintaining the normal flexibility of the lower thoracic spinal column, and such other treatment as may be indicated in the individual case. The water intake must be kept within normal limits; if water drinking is impracticable water must be given by enemas, or by subcutaneous or intravenous injections. In serious acute cases bicarbonate of soda may be administered with the water, however given.

Chronic cases are best treated by dietetic and hygienic measures, together with the treatment outlined in the preceding paragraph.

**Prognosis.** Acidosis occurring during the course of an acute disease is usually fatal; some cases recover with speedy treatment. Acidosis occurring during fever, starvation or fasting has slight ill effects, and passes away with the passing of the causative factors. Chronic cases recover quickly with correct treatment; without treatment they usually recover slowly or die from some intercurrent disease.



## CHAPTER XLIII

### THE DIATHESES

During the last century many diseases were attributed to the existence of some peculiarities of the constitution. With the development of the germ theory of disease the diathesis fell into disrepute as an etiological factor. During the last decade, however, it has become increasingly evident that certain abnormal tendencies of childhood cannot be explained by any of the etiological factors commonly recognized. Hence the term diathesis is returning to a somewhat honored place in modern textbooks. It must be remembered that this term is itself a confession of ignorance.

Osteopathic reports point the way to an explanation of the diatheses. Heredity must be considered as one factor; there seems no doubt that the children of neurotic parents are more apt to be neurotic than are the children of normal parents, and that rickety parents tend to have rickety children, and so on. Experimental work with animals shows that the progeny of lesioned animals suffer from various constitutional abnormalities, as well as from a marked tendency to deformity. Bony lesions, including diminished flexibility of certain spinal areas, interfere with normal development and normal function of the tissues affected thereby. Such tissues show diminished resistance to infections as well as diminished strength and diminished activity. According to the tissues affected by any bony lesion, a child may show symptoms of disturbed nutrition, an excitable condition of the nervous system, tendency to lymphoid over-growth, functional disturbances of the glands of both external and internal secretions, and various resulting disturbances.

Food, environment, training and heredity are undoubtedly factors concerned in the abnormal states usually called diatheses as well as the evil effects of bony lesions, both of the child and of his mother and father.

#### Neuropathic Diathesis

This condition is one of a certain importance both during infancy and during later childhood. Children born of neurotic parents are very prone to the development of nervous symptoms upon the slightest environmental abnormality. Nervous symptoms may appear without any recognizable cause in these children. Cervical lesions are constant. These may be produced at birth, or by improper handling of babies, or by accidents of later childhood.

**Babies** less than a month old may show a marked diminution of the threshold value. Comparatively slight noises and flashes of light cause the child to scream, or to throw the arms and legs about with other manifestations of terror. These babies are often very

precocious and this, unfortunately, attracts the attention of adults, which increases the neurotic state. A slight tonic, muscular spasm, or occasional twitchings of the fingers, arms and legs may be so severe as to suggest meningitis or some other cerebral disorder.

Nervous vomiting and nervous diarrhea are very common in these children. There is no relation between the diet and this nervous vomiting. Unfortunately, changes of diet are frequently made for such children and this is apt to result in mal-nutrition. Usually no loss of weight is caused by the vomiting, although it may occasionally become so severe as to result in serious malnutrition. The diarrhea, like the vomiting, is not associated with improper food. The stools may be only slightly increased in number or they may be much more numerous; undigested food and abundant mucus may be found in this condition. While nervous diarrhea may not result in severe malnutrition in the milder cases, in very severe cases wasting and cachexia may be marked.

The treatment depends upon the recognition of the neuropathic state. Such babies should be kept very quiet and play should be limited to short intervals of quietly interesting games. Any excitement must be avoided; in dressing and bathing the baby, all movements should be calm and unhurried. The hygienic conditions must be kept as nearly normal as is possible. Abundant fresh air is essential. An excess of sunlight is to be avoided, especially in southern climates.

In dealing with the cases of vomiting, the thick cereals are especially useful. One part of some cereal to five or ten parts of milk is used. The cereal should be cooked for from three to six hours. The food may be given with a spoon, or a large hole may be made in an ordinary nipple for the thinner preparations. The necessary water should be given the child during intervals between feedings. It is sometimes difficult to provide a sufficient water intake for these children, in which cases the Murphy drip may be used for an hour or so every two or three days.

The treatment of the diarrhea is that of diarrhea from other causes. Enemas are often useful; they seem to diminish the irritability of the colon and exercise a certain amount of soothing influence upon the smaller intestine.

Children artificially fed may require a reduction in the amount of sugar in the food. Oatmeal gruel, carefully strained and without sugar, is often well taken and is usually satisfactory.

**Older children** who are neuropathic very often suffer from their association with their nervous parents. Boys who are neurotic usually learn very early to smoke; both boys and girls seem to crave tea, coffee, and exciting experiences, and they wish to remain awake late at night; all of which conditions add greatly to the neurosis.

These children are usually thin, irritable, anemic, sometimes precocious and show a marked tendency to change from one occupation to another without ever finishing any game or study. Tachycardia, anorexia, diarrhea, nocturnal enuresis and masturbation are rather common conditions in these children. The latter habit is often supposed to be the cause of the neurosis; it is indeed merely the symptom of the unbalanced nervous system.

Headache, vague and changeable pains in different parts of the body, tremor of the hands, eyelids and facial muscles are very common; these children often suffer from rheumatism and chorea. They tend toward introspection and marked hypochondria is not rare.

Treatment includes the removal of the child from all irritating influences, the nurse or governess who will insist gently but firmly upon a normal regime of living is absolutely essential. If the mother is neurotic, it is usually impossible for her to exercise the necessary control. If the mother is normal and the father neurotic, she may, with proper direction, be able to care for the child in a very satisfactory manner. It is evident that the previous training which the child has received is not that which is the most satisfactory and some very definite modification of his way of living is necessary if he is to overcome the neuropathic tendency.

These children are usually much benefited by association with normal children of about the same age. While it is not desirable that these children should be forced to study for very long periods of time, yet it is good for them to go to school and to be subjected to the regulations which are properly made for the conduct of children in school. It is necessary that a certain amount of supervision should be exercised over his playtime in order that harmful teasing and bullying by older children may be avoided.

It is especially necessary that these children should not be allowed to attend moving picture or other theatres, should not take long rides, should not be allowed to attend children's parties or to engage in any strenuous game until the nervous system has attained a more normal stability.

Peripheral irritations should be removed. The removal of tonsils, adenoids, and small tumors should be secured for these children, as for other children, when the necessity for these operations becomes apparent. Circumcision may be necessary for either boys or girls. No surgical operations should be performed unless the structural conditions indicate it.

The ideal treatment for these children is to put them in the country where interesting occurrences are wholesome and common and a certain amount of responsibility is laid upon them. The sunshine, fresh air and abundant space for playing, with wholesome associates in school and a good wholesome diet are most advantageous.

## Status Lymphaticus

(Lymphatism; Lymphatic Diathesis)

A tendency toward enlargement of the lymph nodes, with or without a persistent thymus, seems often to be hereditary. The disorder is usually recognizable in babies or young children, although it may first display itself in later life. The condition may fail to be recognized until after the sudden death of the child.

The thymus may be enlarged, sometimes to ten times the normal size, and other lymphoid tissue remain normal.

Hyperplasia of the lymph nodes, especially those of the neck, is a common symptom in tuberculosis. The term lymphatism should be applied only to those cases in which the lymphoid hyperplasia is without recognizable cause.

**Etiology.** The cause of the condition is unknown. Heredity seems to play some part. Whether the toxemia so often noted is the cause of the lymphoid hyperplasia and the persistent or enlarged thymus, whether the toxemia is the result of the abnormal metabolism of these tissues, or whether both toxemia and hyperplasia of lymphoid tissue are the result of some antecedent dyscrasia is not yet known. Rickets, spasmophilia, various exudative conditions, and certain forms of malnutrition may be associated with or precede the development of the status lymphaticus. In other cases, the condition appears at birth, or within a few days thereafter.

**Tissue changes.** At autopsy the thymus alone may be found enlarged, sometimes to ten times the normal size. Usually, however, all of the lymphoid tissue of the body shows some hyperplasia. The lymph nodes of the neck are especially conspicuous. The tonsils are usually enlarged, but not to a greater extent than is common among children. Adenoids are usually present, and may be very large. The spleen is not greatly enlarged. Peyer's patches may or may not be affected. The liver and sometimes the heart show evidences of mild degrees of fatty degeneration.

**Diagnosis.** The symptoms vary. In many cases the condition is not suspected until autopsy. In many cases in which death is supposed to be due to suffocation by bedclothing, or by the pressure of the arm of an adult, thrown across the baby's face during sleep, the real cause of death is status lymphaticus.

Adenoids and enlarged tonsils are usually considered identical with those to which many children are subject. Operation for the relief of these conditions may cause death. Asthmatic attacks are common, increasing in intensity until death occurs in an attack. In some cases the children are rather pale, inert, obese, and indisposed to any mental or physical exertion. The last factor is beneficial, and preserves life from sudden termination in many cases.



These children are in great danger of sudden death. The use of a tongue depressor, a cold bath, a fall, the administration of anti-toxin or an anesthetic, or the onset of an acute infectious disease may be speedily or instantly fatal.

Any child who is pale, overweight, lazy, and who has enlarged lymph nodes should be suspected of having lymphatism. The enlarged lymph nodes may be recognizable upon palpation, and a large dull area in the upper part of the thorax may be due to the enlarged thymus. The X-ray examination gives more definite information as to the condition of the thorax, lymph-nodes and the thymus.

**Treatment.** Children in whom lymphatism is suspected should be carefully protected from shocks; no surgical operation should be performed if it is possible to avoid it. Emotional storms, sea-bathing, and violent exercise are to be avoided. The hygienic conditions must be made as normal as possible; a wholesome, varied diet is indicated.

Whatever structural conditions are found upon thorough examination should be corrected by careful treatment, but no urgent or strenuous work should be done. Carefully graded gymnasium work and moderate play in the fresh air and sunshine should increase the general strength and carry the child through the dangerous years of his early life.

If these children can be kept in moderately good health until after puberty is passed, no further trouble is to be expected. The parents must recognize the possibility of sudden death upon slight, or no recognizable provocation.

### Exudative Diathesis

The term is applied to a condition characterized by a tendency to catarrhal inflammations of the mucous membranes and the skin.

**Etiology.** The condition is familial or hereditary, at least to some extent. Dietetic errors are probably causative factors in most cases; excess of fat and of the sugars is usually to be found. It is the tendency only that is constitutional; so long as the hygiene and the diet remain correct, the children are usually fairly well; but any very slight departure from correct living, or exposure to cold, or irritation of the skin or mucous membranes results in serious attacks.

**Diagnosis.** Little babies suffer most from eczema and seborrhea of scalp and face; later attacks of rhinitis, bronchitis, otitis and diarrhea occur upon the slightest provocation. Urticaria, pruritis, rheumatic symptoms, the geographic tongue, phlyctenulae and recurrent vomiting are common symptoms. Vasomotor symptoms and irregular, fleeting attacks of fever are often noted. The lymph nodes draining the diseased areas may be enlarged, but true hyperplasia is

not noted. The children are pale, but may be either under or over weight.

Bony lesions are constant, but their etiological importance is not demonstrated.

The urine shows no characteristic changes. The blood shows some anemia of the secondary type, and, invariably, a considerable increase in the eosinophiles. These are found both with and without eczema. The sugar and the chlorides may be increased, in the blood.

There may be some difficulty in the differential diagnosis between tuberculosis and the exudative diathesis. The status lymphaticus may also present confusing complication. The child with a tendency to the exudative disorders is usually very prone to become tubercular.

The blood in tuberculosis does not show marked eosinophilia, and skin lesions are not usually pronounced in tubercular children. The electric phenomena of spasmophilia are not present in exudative children. The lymphoid enlargement is local in exudative, and general in lymphatic children. Combinations of these, and tubercular infection of children with the diatheses, may present great difficulties in diagnosis.

**Treatment** varies according to the conditions found on examination. Lesions are to be corrected according to the structural relations present. Dietetic errors are invariably found. Excess of fat is a common error; the fat should be lower for these children than for others of the same age. A nursing baby should be given one to three teaspoons of water just before nursing, in order to dilute the milk. A very thin cereal may be given if the nutritive value of the food seems too low; the cereals contain certain useful vitamins also. The mother of a nursing baby must not eat much fat, nor any fried food, and she should not use much salt. Diluted orange or prune juice should be given each day, for the sake of the vitamins.

The food of the baby on artificial food should be carefully studied; and excess of fat or sugar immediately removed. The fat and sugar should be kept below the amount usually given a child as old as the patient. No salt should be permitted at all, for babies or for children of any age suffering from the exudative states. Goat's milk may be substituted for cow's milk if the condition persists. Successive and rapid changes of food are not desirable.

Vitamin containing foods should be freely given. Little babies may be given diluted orange or prune juice, later other fruit juices, vegetable juices, vegetable purees, and then cooked and raw vegetables, fruits and salads may be given.

Irritating clothing must be avoided. Each child is a law for itself in many ways, and only by watchfulness can harmful foods, clothes and habits be determined and eliminated.

**Prognosis.** Children properly treated recover within a few weeks or months. Without treatment, with only ordinary care, they tend to recover within one or two years. By the time puberty is reached, they are usually in fair health.

Complications, especially tuberculosis, may prolong the period of ill health, or may lead to early death.

## CHAPTER XLIV

### SCORBUTUS

(Scurvy, Barlow's Disease; Acute Rickets; Infantile Scurvy)

Scorbutus is a disease of early childhood due to deficient diet. It is characterized by severe pain, hemorrhages and diarrhea.

**Etiology.** The disease occurs most commonly between the ages of five and fifteen months. The first symptom noted is pain in the muscles, greatly increased by handling. Many children suffer from this disease and are supposed to be merely fretful and cross, for this reason it is probable that the disease is more common than is ordinarily supposed.

The real cause of the disease is a lack of vitamin C. Children fed upon proprietary foods exclusively, or upon cow's milk which has been boiled or pasteurized most commonly suffer from scorbutus. Breast fed babies are occasionally affected.

The vitamins present in the new-born child appear to be sufficient to provide for its needs for four to six months. After this, unless the food provides at least a part of the necessary vitamin C scorbutus is inevitable. Children fed upon boiled milk or proprietary foods and who receive orange juice or other foods containing the vitamin C do not suffer from scorbutus.

**Symptoms.** The first symptom is pain in the muscles; the child lies quiet and cries when he is handled or bathed. The pain may be so severe as to cause a pseudo-paralysis. A mistaken diagnosis of infantile paralysis may be due to this immobility. The child is fretful and cross and may show slight and irregular fever. The position is characteristic, he lies upon his back, slightly turned to one side, the body is curved slightly, the knees are semi-flexed, and the thighs slightly abducted.

The diarrhea is sometimes lacking, it bears no relation to the food, and no evidences of infection are present. At first imperfectly digested food materials make up the stool. Later, black tarry stools, or blood only partially digested, or rarely, clear fresh blood indicate the occurrence of intestinal hemorrhages. Nausea and vomiting are not common. Hematemesis may occur.

The gums are very characteristic. At first they are congested, swollen and spongy; later, the blood accumulates and sub-mucous hemorrhages occur, often forming bright purple bag-like folds, which may completely cover the teeth. The teeth loosen; teeth which are unerupted may fail of proper development.

Subperiosteal hemorrhages are especially characteristic of this disease and are responsible for much of the suffering. The extrav-



asated blood may so distend the periosteum especially at the long bones of the legs as to cause an X-ray shadow two or three times as broad as the normal bones. This blood coagulates and later becomes organized, resulting in serious deformity. The development of the bones is impeded and the deformity thus resulting may, in prolonged cases, be permanent. Such bone as is formed is normally developed. The cells of the bone marrow disappear, probably due to hemorrhages and a loose connective tissue takes their place.

Later anemia, wasting and cachexia appear, subcutaneous hemorrhages are marked in severe cases.

The diagnosis rests upon the symptoms and upon X-ray findings, together with the history of deficient diet.

Scurvy may be confused with rickets, with which it is often associated. The differences shown by the X-ray should be sufficient to distinguish the two diseases. Infantile rheumatism is an erroneous diagnosis often made by the mother or nurse; it may lead to erroneous treatment and the life of the child be endangered.

**Treatment.** Of first importance is an immediate change of diet. Vitamins are to be given at once. Orange juice is probably the most satisfactory source of vitamin C. It is palatable, easily secured, and not usually very expensive.

Tomatoes are even less expensive, and are about equally efficient, though tomato juice is rather less palatable than orange juice.

Osteopathic treatment is of great value in these cases. The muscles are usually weak, and there is usually marked tendency to spinal curvature. There is often some definite lesion, and the correction of this may result in improvement in children who had previously failed to improve upon excellent dietetic regime. Great care is necessary to avoid causing pain, but with care definite corrections can be made and spinal deformity prevented. Nutrition improves remarkably under such circumstances.

The dietetic requirements vary somewhat, according to the previous history of the child's feeding. The vitamin C is always indicated, and, as has been said, is best given in orange juice. A child two months old should be given one teaspoonful of orange juice mixed with four teaspoonsful of boiled water twice each day at first. The amount should be increased and the dilution diminished until the child is taking two ounces of orange juice and water in equal proportions. If orange juice can not be secured, other fruit and vegetable juices provide the vitamin C in equally useful amounts, but not in so palatable a form. The juice of tomatoes, either raw, cooked or canned, is easily secured and is inexpensive. It should be given in the same manner as orange juice. Beef juice is very useful in these cases. The advisability of administering fruit juice to babies with diarrhea may seem doubtful, but even the diarrhea, when it is

a symptom of scurvy, clears up with remarkable celerity when fruit juices are given. Children ten months old or more may be given seraped beef, the juice from raw, grated potatoes, cabbage juice and the juice from yellow turnips, all of which contain the vitamin C very abundantly and in palatable combinations.

Human milk is desirable, but can rarely be secured.

Goat's milk may be substituted for cow's milk, if human milk is not obtainable. If the hemorrhage and the anemia are severe infusions of human blood may be given.

Hygienic conditions should be corrected if any unsanitary conditions are found.

**Prognosis.** It is very rare that children die from scorbutus alone. Intercurrent diseases are very speedily fatal. Bronchopneumonia is especially fatal in these children. When it is associated with rickets the resulting deformity is very severe.

## PELLAGRA

Pellagra is a disease which is found at all ages, it is characterized by a peculiar eruption effecting exposed parts of the body, diarrhea and mental depression.

**Etiology.** Present knowledge seems to ascribe the disease to a diet deficient in proteids. The disease first appeared in Spain, later in Italy. Lombroso attributed the disease to the presence of fungus often found in polenta, a dish made of corn meal, which is the chief article of diet among Italians of the class most subject to pellagra. It is now known that pellagra occurs in people who do not eat corn meal, but whose diet is composed of a large excess of cooked cereals and sweets with a very considerable deficiency of fruits, vegetables and proteid foods. It is rather common in the Southern states, especially among people who eat abundantly of hot breads with bacon and molasses, and who do not eat fresh fruits and vegetables.

Several infectious agents have been described but none of these have been shown to be important in etiology. Several experiments have been performed which seem to demonstrate conclusively the fact that deficient diet is the cause and is probably the sole cause of pellagra.

Pellagra is rare in babies unless the mothers are pellagrins. After the age of two the disease is more common. It is much more common among the poor and those living in unhygienic surroundings. It is rather more common in the country than in the city, other things being equal.

**Symptoms.** In very mild cases the symptoms may not be recognizable; in well developed cases there is no room for doubt.

The seasonal periodicity of the recurrences is pathognomonic. The disease appears in the early spring, most commonly, and recur-

rences are always noticed in the spring. During the summer the symptoms grow more marked and they diminish or disappear altogether with the onset of cold weather.

Three groups of symptoms are very characteristic. The cutaneous lesions usually appear first. The hands, face, neck, feet, and legs are symmetrically affected. At first an erythema is noted, which resembles sunburn in all respects. There is some burning and occasionally itching as in sunburn. After a variable length of time the skin becomes more rough and thick. In "wet pellagra" the superficial layers form bullae and vesicles; these rupture, leaving weeping surfaces; rarely ulceration occurs. In "dry pellagra" exfoliation is very marked and shreds of the desquamated epithelium may be rubbed off from the affected areas. If the trunk of the child is exposed to the air and especially to the sunshine the entire body may be involved in the eruption. Brunettes often show marked brownish discolorations, especially when the eruption is clearing up, as it usually does in the fall. In blondes the discoloration is much less marked. The nails are not affected.

The digestive symptoms may precede the cutaneous symptoms, nausea and vomiting are very rare. Anorexia is usually marked. There may be intense craving for unusual and unwholesome articles of food. The child may chew hair or cotton. Diarrhea is almost constant. Very severe constipation alternating with attacks of diarrhea may be found. The stools are thin and watery and may contain abundant mucus and fresh or partially digested blood. There may be from three to twenty stools each day. Nothing of pathognomonic significance is found in the stools.

The mental symptoms are much less marked in children than they are in adults. An anxious, sorrowful look is rather characteristic; the children become fretful and apathetic. The reflexes are usually exaggerated. Ankle clonus is occasionally found and muscular tremor may be quite marked upon exertion.

The periodicity of the recurrences has already been mentioned. At each yearly attack all the symptoms are more marked, and some new abnormality is usually noted each year.

Death does not occur from pellagra as a rule. The continuance of the diarrhea may be fatal. Intercurrent infections are often fatal in pellagrins. Occasionally a child dies from exhaustion and malnutrition. Recovery is not to be expected unless the diet is corrected. With correct osteopathic treatment, the time required for recovery is diminished.

Tissue changes in pellagra are not marked, except for the cutaneous lesions. The symmetric location of these has given rise to the expressions, "pellagrous boot", "pellagrous glove", "pellagrous mask", "Casal's necklace", and the "pellagrous collar".

**Treatment.** Prophylaxis is important. The overuse of corn meal and of other carbohydrates, the overuse of salted meats and of fried meats, and the lack of fresh fruits and vegetables and meats, is the chief factor in etiology, hence a proper diet is of the utmost importance in preventing the disease. Mothers, especially, must be taught the character and the necessity of adequate diets for children.

Pellagrous mothers should not nurse their children, if this is in any way to be avoided. If normal human milk cannot be secured, goat's milk may be given. In any case, orange and prune juice, tomato juice, and the juice from other raw vegetables must be given. A baby two months old may have a teaspoonful of orange juice mixed with three spoons of water. As the child grows older, the juice can be increased in quantity, and the dilution made less. The water in which vegetables have been cooked can be given, diluted according to the strength of the broth. Meat broths and beef juice can be given quite small babies, and this seems to be very useful for pallagrous babies. Older children may be given raw and cooked vegetables in abundance, and may be given beef juice or be allowed to eat the freshly cooked meat. Whole grains of cereals, well cooked, may be given in moderation. All carbohydrates must be kept at the lowest possible nutritional level. Common salt must be avoided almost or quite completely.

Osteopathic treatment is very important. At least once each day, for a few days, and then twice each week, the entire body should be examined and all indicated corrections made,—with gentleness, of course. Cervical lesions are practically invariable. Correction of these often gives immediate relief from the mental symptoms. The ribs should be raised freely and often. Correct breathing habits should be secured, if possible.

No attempt should be made to compel mental alertness. The mental state invariably clears up with a return to normal circulation of normal blood through the brain.

Sunshine should be excluded from the skin, and it is usually best to keep the child in a room not too strongly lighted. Any pleasant and soothing ointment may be applied to the skin lesions. The weeping surfaces are usually best treated with some dusting powder.

The diarrhea usually disappears at once, with the osteopathic treatment, or with the correction of the diet alone. Enemas of weak soda solution or of tap water may be helpful, especially in those cases with constipation.

All treatment must be energetically employed during the late winter and early spring, since exacerbations are to be expected with the onset of warm weather.



**Prognosis.** With proper treatment recovery is to be expected, even in very severe cases. After two years have passed without recurrence, the child may be considered cured, but all his life he should eat rationally.

### ACRODYNIA

(Pink Disease; Erythredema; Dermatopolyneuritis)

This is a disease of unknown origin, characterized by cutaneous, mental and nutritional symptoms somewhat resembling those of pellagra. The disease has been recognized in Australia for many years, but only recently has been described in the United States. No cases have been reported by osteopathic physicians, and no adequate discussion of the nature of the disease can be given.

**Etiology.** Children are most commonly affected, though adults may suffer from it. Breastfed babies, whose mothers have been upon an apparently adequate diet, may suffer from the disease. The nature of the symptoms suggests some deficiency in the food, as seems to be the case in pellagra, but nothing is known at present as to the nature of the deficient factor.

**The diagnosis** rests upon the symptoms. The onset is rather insidious. The rash may be the first symptom noted, or this may be preceded by very intense burning or itching of the palms, soles, or of the entire hands and feet; rarely the itching is of considerable extent. The skin becomes pale red, purple or brownish in color, and there is variable desquamation. There may be an eruption resembling that of measles, eczema, scarlet fever, erythema or impetigo, or it may appear in blotches resembling urticaria. In any case the desquamation appears later, and a series of successive attacks of rash and desquamation may occur. The mucous membranes may be affected, with ulcers of the mouth and loss of teeth. Occasionally a severe bronchitis is the first conspicuous symptom. Severe sweating is usually noted; there may be a peculiar fetid odor associated with the perspiration.

The temperature is usually subnormal, though slight feverishness is occasionally noted.

The nervous symptoms are constant. Symptoms of peripheral neuritis are always present. The knee jerk is lost. Variable paralyses may be found; there may be marked muscular atrophy, as in lower neuron paralysis.

Mental symptoms are constant, and include insomnia and severe restlessness; the child is always irritable, miserable and morose. He sleeps only for a short time, complains almost constantly, and can find no comfort anywhere. Handling the child causes great discomfort.

Digestive symptoms vary. The mouth may be swollen slightly, or may contain serious ulcers; the teeth may be lost as a result of softening of the cement substance or as the result of the deep ulcers of the gums. Diarrhea may be severe or may be absent. The stools may be bloody or may be very foul. Vomiting is not common, but may be very severe. Tympanites and abdominal discomfort may be absent or may be a cause of great discomfort. Anorexia is constant and is usually severe. Proctitis and perianal ulcers are occasionally noted. Erythema and ulceration of the skin of the external genitals are sometimes associated with itching and scratching.

The kidneys are slightly affected. Albumin, casts and renal epithelium are usually found in the urine, as in toxic or eruptive diseases.

The blood shows moderate leucocytosis (rarely exceeding 20,000) with relative preponderance of neutrophils. The erythrocytes and hemoglobin are slightly diminished. Polycythemia has been reported; a diminished water intake may account for this, with the increased sweating. The viscosity and coagulation of the blood are never subnormal, but may be somewhat increased. Hemorrhages are not reported.

**Treatment** seems to be of little avail. The resemblance of the disease to pellagra indicates careful study of the diet, in the search for some relative or absolute deficiency or excess of important factors. The breastfed baby should have orange juice, prune juice, the juice of cooked or raw vegetables added to its diet, according to the age of the baby. If possible to secure a wet nurse in good health, this may give speedy relief. Water must be given very freely.

For the skin lesions, any of the usual powders, lotions or salves may be used; these are efficient in the order given, though there is considerable variation among children in this respect, and in the same child at different stages of the disease.

Enemas should be used for cleansing the colon. Laxative and purgative drugs should be carefully avoided.

Since no cases have been reported by osteopathic physicians, the corrective treatment cannot be outlined, but must depend upon the conditions found on examination.

**Prognosis.** Death occurs within ten days in about half of the cases reported in this country. If the child lives two or three weeks, recovery occurs, and no evil after-effects are to be expected. The disease seems to be self-limited, if the child has strength to endure its course.

## CHAPTER XLV

### RICKETS

(Rachitis)

This is a very common disease of childhood, especially in cities. It is characterized chiefly by changes in the skeleton, but the entire body is affected. It is almost universally present in some degree in children of dimly lighted and unsanitary tenements.

#### **Etiology**

The cause of rickets is not yet definitely known. Lesions of the upper thoracic vertebrae, especially the fourth, have been found in all children examined in the very early stages of the disease. Such lesions are known to affect digestion and absorption, and may be at least partially responsible for the disturbed metabolism. Later, after the bony changes are well developed, great skeletal deformities may be found.

The disease is rare before the age of six months, or after two years.

Some disturbance in the calcium-phosphorus metabolism is the essential feature. The amount of calcium in the food is probably always sufficient; certainly the amount of calcium in cow's milk is much greater than that of human milk. Phosphorus also is probably present in sufficient amount in any ordinary baby food. Improper combinations of these may be responsible for the baby's inability to make efficient use of them. Experiments upon animals seem to indicate that deficient phosphorus causes more nearly typical rickets than does deficient or lacking calcium.

**Sunlight.** The disease is especially prevalent in dimly lighted tenements, and during the winter months, and it has long been considered that an increase in the sunshine is a valuable part of the treatment of rickets. Negroes and Italians are not subject to rickets in the south, or in the tropics, but in northern cities, especially in the tenement districts, the babies of these races are almost universally rickety. The pigment of the skin probably is responsible for their inability to use the small amount of sunlight in any efficient manner. A diet which is somewhat defective, but which does not cause rickets in animals in sunny rooms, does cause rickets when given to similar animals kept in dimly lighted rooms. These rickety animals quickly recover upon the same diet when they are admitted to sunny rooms, or when, in the same dim rooms, they are exposed to the action of certain types of electric lights rich in ultraviolet rays. Sunlight

itself is not essential if the ultraviolet rays are focused upon the experimental animals.

**Vitamins.** A fat-soluble vitamin, not identical with vitamin A, seems to be essential to normal bone formation. This vitamin is plentiful in human milk and in goat's milk, is less plentiful in cow's milk, and is present in very great amounts in cod-liver oil. The administration of cod-liver oil is one of the classical methods of treatment for rickets, and the presence of this vitamin explains its frequent efficiency. Since the vitamin is present in necessary amount in human and in goat's milk, and since cod-liver oil is occasionally a cause of digestive disturbance, its use is probably not often desirable.

**Internal secretions.** The skeletal deformities associated with tumors of the pituitary and with disturbances of other internal secretions has suggested an endocrine etiology for rickets. A few cases have been reported in which the administration of adrenaline has been followed by improvement. On the other hand, this treatment has seemed to be harmful in other cases, and there now seems, on the whole, no reason to suspect any endocrine disturbance as a cause of rickets.

**Heredity.** Children of parents with a history of rickets seem, on the whole, to be rather more often affected than children born of normal parents. The place of heredity as a cause of rickets is not definitely known. Parents who have had syphilis, tuberculosis or any wasting disease seem to have rickety children rather more often than do normal parents. Premature babies are often affected. Indeed, any cause of malnutrition or of physical weakness seems to increase the tendency to rickets.

**Diet.** Breastfed babies seem rather less frequently affected; about one-fifth of all children with rickets are or were breastfed. Children whose nursing has been unduly prolonged, or who are given an unduly high proportion of milk after the age of one year, seem especially prone to rickets. A diet lacking in fat or in proteids also predisposes to rickets. Children with wasting diseases rarely show rickety symptoms, and the rickety child may contract a wasting disease and show marked improvement from the rickety symptoms, though he may die from the concurrent wasting disease. Animals with rickets may be starved for some days, and show marked improvement in the rickets.

**Race.** Races indigenous to the tropics do not have rickets in their native clime, but they are decidedly rickety when they move to north temperate zones. Races from temperate climates may go to the tropics, and, whatever diseases they may contract, they do not have rickets. Arctic countries, and the countries near the arctic circle, almost never have rickets. The semi-tropical climates seem to confer almost complete immunity upon the children living there.



The climatic influence seems to be almost altogether a question of sunshine; so far as the tropics are concerned, while the immunity of the far north seems to be partly a question of high fat in the food, and partly a question of complexion; the brilliant summer sunshine, the abundant reflexion of the shorter wave lengths by the snow in the spring and autumn months is probably also a factor in preventing rickets.

### Pathology and Physical Findings

Tissue changes affect the entire body, though the bones show the most marked effects.

Chemically, rickety bones show marked variations from the normal. Calcium and phosphorus may be reduced to 25 per cent of the normal, while the water and the organic constituents are proportionately increased. It is this change which causes the great amount of callus which is formed in rickety bones, and also which permits so many "greenstick" fractures.

The histological structure of the developing bones shows marked modifications. These changes may be mentioned very briefly in this connection; for the complete description of the pathology of rickets some textbook on pathology should be consulted.

Rickety bones show marked hyperemia, with excessive formation of capillary loops; excessive proliferation of cartilage; irregularity and great broadening of the line of ossification with marked disturbance of the zonal relations; very deficient deposit of calcium and phosphorus with increase in the amount of osteoid tissue, and failure of the osteoid tissue to develop into true bone. The periosteum becomes thickened and associated with abnormal masses of osteoid tissue, with resulting deformity. Trabeculae are absorbed, the marrow is increased in size and more hyperemic than is normal. Halisteresis occurs in localized areas, and lime may be deposited in unorganized masses.

**Head.** The peculiar box-like shape of the head is characteristic. This is produced by the flattening of the occipital region and the over-growth upon the lateral aspects of the frontal bones. The whole head is usually broader than normal. The flattening of the occipital area of the skull is due to the weight of the head upon the pillow; if the child lies habitually with the head turned to one side, very marked deformity of the skull results. It must be remembered that all of the bones of the body are more flexible than normal in this disease. Especially toward the posterior region of the skull, the bone frequently becomes greatly thinned so that the pressure of an examining finger causes recognizable depression in the skull. These thin membranous areas are called *craniotabes*. The formation of aberrant osteoid tissue upon the flat bones, especially the parietal and the frontal, results in the presence of bosses. The deformity thus produced is upon the outside of the skull and no pressure upon the brain results therefrom. Bald spots are often found on the back of the head.

**The teeth** usually are delayed in appearance and there is a great tendency for them to appear out of their proper order. The teeth of the rachitic children often decay very early and both the temporary and the permanent teeth may be variously furrowed and notched. Delayed dentition may be the first symptom noticed.

**Thorax.** The weakness of the ribs, together with the respiratory movement cause great deformity to be noted in the thorax; the bending of the ribs in the costochondral articulations may be the first recognizable bony change. Depression of the cartilages is common, the sternum is usually more prominent than normal and this causes the condition called "pidgeon breast". The angles of the ribs frequently bulge posteriorly, the "violin chest" is due to

these deformities. Harrison's Groove corresponds to the insertion of the diaphragm and is due to respiratory efforts in the child whose weakened ribs fail to secure the proper expansion of the lungs. The "rickety rosary" consists of a series of knob-like protuberances at the costochondral articulations.

**Spinal Column.** A certain degree of spinal curvature is very common in rickety children. This curvature is due in part to the weakening of the ligaments. The bodies of the vertebrae are not conspicuously affected. Kyphosis thus produced may resemble Pott's disease. The X-ray differentiates. The pelvis is frequently affected. The anteroposterior diameter is usually considerably shortened, the outlet is usually much narrower, the crests of the ilia usually much thickened. These pelvic deformities are frequently produced in children showing slight, or no other evidences of rachitis. The results of these deformities seriously interfere with pregnancy and labor during later life.

**The limbs** are usually seriously deformed. The enlargement of the epiphyses, especially at the wrist and ankle, is usually conspicuous. The shafts of the long bones are variously bent according to the weight placed upon them. Green stick fractures are very common. Fifty of these have been known to occur in a few months in one child.

The growth of the long bones is frequently impeded and permanent dwarfism may be the result. Flat foot is very common and is due to the relaxation of the ligaments.

**Ligaments.** All over the body the ligaments and other connective tissue become atonic, weak and less elastic than normal; this condition is an important factor in permitting deformity, especially of the spinal column, the large joints and feet.

**The muscles** become atonic, weak and sometimes so small and their function so greatly diminished, that a diagnosis of infantile paralysis may be made. The "pot-belly" is almost invariable and is due to weakness of the abdominal muscles, together with the flatulence usually associated with weakened gastric and intestinal walls. This condition alone may be a further cause of constipation.

**Skin.** A peculiar transparency and pallor of the skin are usually noted. The veins are very commonly enlarged, especially those at the root of the nose and over the scalp. The subcutaneous tissues are flabby, although the child may occasionally seem to be fairly well nourished.

**Respiration.** The tonsils are usually enlarged; adenoids are usually present; bronchitis and bronchopneumonia are common. Breathing is generally diaphragmatic; the softness of the bones and the weakness of the muscles of the thorax prevent proper expansion of the thoracic walls, hence diaphragmatic breathing is inevitable. The deformity of the chest may greatly interfere with correct diagnosis in pulmonary diseases occurring in rachitic children.

**Circulation.** The entire musculature of the heart and blood vessels is weaker than normal; the blood-pressure is low and a moderate dilatation of the heart is very common. Superficial veins are often distended.

**Lymph-nodes.** The spleen is usually enlarged and this may be a complication, or it may be due to the disturbed metabolism of the rickets; it must not be forgotten that the shape of the thorax in rickety children permits the spleen to be more easily palpable than is the case in normal children.

## Diagnosis

The symptoms of rickets vary in early cases, but are definite when the disease is well developed.

Sweating of the head, especially during sleep, is an early symptom. A peculiar bronzing of the skin over the knuckles may precede

this; rickets should always be suspected in either condition. Night terrors, restlessness, and a peculiar rocking of the head during sleep may be the first symptoms noted.

Delayed dentition is frequently the first cause of suspicion of disease. Questioning usually elicits the presence of the other symptoms just mentioned. Deformity of the bones may, in some cases, be the first symptom noted by unobserving parents.

Convulsions resembling those of spasmodophilia often occur.

Mentality is rarely affected; indeed, rickety children often seem particularly acute.

Digestion is affected in about half the cases. Catarrhal gastritis or enteritis or colitis is common, either upon slight or no recognizable provocation. Constipation is common and often alternates with attacks of diarrhea. The liver often seems enlarged, but this may be due to the ptosis alone.

Many mild cases remain unrecognized until autopsy, or until pelvic measurements show a rickety pelvis; this is most commonly found during pregnancy and labor.

Laboratory examinations are interesting, but not usually necessary to diagnosis.

Blood. In mild or early cases the blood shows nothing characteristic. In serious and late cases the findings of secondary anemia are noted. The erythrocytes remain about normal in number; the hemoglobin is diminished to about 60 per cent of the normal for the age of the child. A mild leucocytosis is present in about half the cases. It must be remembered that the leucocyte count is higher in children, varying with age. The blood contains rather more than the normal amount of lime, in nearly all cases where the blood has been analyzed.

Kidneys. The urine shows no characteristic changes in mild cases. Calcium oxalate crystals are often found when the anemia is found, and these are due to imperfect oxidation. The total amount of calcium in the urine is diminished in rickety children, while the amount of calcium in the feces is increased. With recovery, the calcium of the urine increases, after a short period of retention of calcium, while the amount of calcium in the feces returns to normal. During the florid stage of rickets, total excretion of the calcium salts is above normal; and usually is above the calcium intake.

Feces. No definite change in the feces has been reported, except that certain observers have reported that a relative excess of fecal lime over urinary lime is present during the active stages of rickets, while the relation returns to normal with recovery.

Kyphosis resembling Pott's disease may give difficulty in diagnosis. X-ray plates show erosion of the bodies of the vertebrae in

Pott's disease, while in rickets the bodies of the vertebrae remain normal. Doubtful cases may occur, in which only the progress of the disease can make the diagnosis certain.

Hydrocephalus may be suspected from the increased size of the head. Deformities of other bones than the skull leads to a diagnosis of rickets. The two diseases may coexist.

Infantile myxedema may be confused with rickets in which the pot-belly is the most marked symptom. Determination of the basal metabolism settles the diagnosis quickly. The peculiar facial expression and mental defects of the cretin, and his speedy improvement under thyroid treatment, make the diagnosis certain.

Hereditary syphilis may give some difficulty. Lesions of the lips and skin are usually present in syphilis. The X-ray examinations of the bones should make clear the difference between the two diseases.

Poliomyelitis may resemble a case of rickets in which the muscular weakness and pseudoparalysis are the most marked symptoms. When the rickety child is lying at rest, no muscular paralysis is found. The condition of the reflexes, the electrical reactions, and the presence or lack of atrophy should determine the diagnosis easily in most cases. The rickety child recovers completely, while the child with poliomyelitis remains paralyzed to some extent.

Several other rare diseases may cause difficulty, but a carefully planned X-ray plate, together with the lack of symptoms typical of other diseases, should prove rickets without great difficulty.

Malnutrition may be confused with an early case of rickets. History of some cause of the malnutrition, and the presence of other symptoms typical of malnutrition should establish that diagnosis, while other typical symptoms of rickets, such as sweating of the head, and typical X-ray plates, confirm the diagnosis of rickets.

Congenital rickets has often been described. More careful study of recent cases of apparent congenital rickets shows that these are really cases of chondrodystrophy or of osteogenesis imperfecta. Probably typical rickets never occurs before birth or in very little babies.

Acute rickets or hemorrhagic rickets, so-called, is really scurvy, or a coexistent scurvy and rickets.

Late rickets appears in children after the age of six and before puberty. In these cases progress is very slow and deformity not marked. Since the disease begins after the bones have become fairly well developed, typical rickety deformity could not be produced. In these cases the epiphyses may be enlarged and a tendency to bow-legs or knock-knees result. Pain in the joints, especially of the knees, headache and backache are common. This type of disease persists as long as the diet remains improper, and it disappears speedily when sufficient amounts of butter, cream and fresh green



vegetables are added to the diet, and with a sunny and wholesome environment.

Rickets with spasmophilia, and rickets with scurvy, are common combinations of the result of dietetic deficiencies.

Adolescent rickets is rare. It may occur between puberty and the age of twenty-five years. Deformity of the bones is due to halisteresis; the softened bones then yield to pressure, as in the usual type of rickets. Bow-legs and knock-knees are common deformities. Recovery follows correct diet, increase of fresh air and sunshine, and improvement in hygienic conditions. Surgery should not be used for the correction of the deformity until after the disease has been properly treated and the progress has ceased; otherwise deformity is increased and not corrected.

### Treatment

Osteopathic treatment is very useful in these cases. In many instances, rickety children have failed to recover under the best of hygienic and dietetic treatment, but have immediately begun to recover when the indicated adjustments have been made. The fourth thoracic vertebra is most often at fault. Other upper thoracic, lower cervical and upper rib lesions have been reported. Two or three times each week a very gentle treatment should be given, not only correcting lesions as found, but also securing satisfactory motion of the vertebral and costal articulations. Manipulations given while the child breathes according to directions are useful. The bones are very soft, and many deformities can be diminished or removed altogether by means of careful manipulations. After recovery begins, the correction of the various skeletal deformities may be almost or quite secured by correct osteopathic treatment.

Breast milk is the one perfect food for the prevention and cure of rickets during the nursing period. Therefore, a wet nurse for rachitic nursing children is the most satisfactory form of treatment. The breastfed child with rickets requires additional food as given below. Cow's milk is the best artificial food to prevent rickets.

Boiled milk does not produce rickets. This statement is made in the face of tradition to the contrary. Whole milk, too greatly diluted, may cause rickets just as whole milk with the addition of too much starch diluent may be a cause. Anything that disturbs digestion and prevents assimilation is a potential cause of rickets.

It may be well to repeat here the statement that caution should be used in feeding barley water. This is a valuable food in certain cases but in suspected rachitic conditions and in advanced cases barley water should not form a part of the diet.

Lime water is another addition to the diet that is commonly used in rickets. There is no evidence that it does good. To accomplish

the purpose for which it is supposedly given it would have to be offered in larger quantities than the child could possibly take. Rickets is common in children who have been fed lime water.

Since most of these children are receiving excessive starchy food, it is necessary that a well-balanced diet should be immediately prescribed. It is usually best to remove the starches from the diet for a time and to add them rather gradually after a few days. If fat is well taken, it should be given in increased amounts in most cases; codliver oil is especially valuable on account of the large proportion of fat-soluble vitamin A and the possibility of another vitamin closely related to the vitamin A, but not identical with it. Beef juice, orange juice, and broths are especially desirable additions to the diet. The juice of tomatoes, yellow turnips and other fruits and vegetables are also very desirable. As soon as the child is old enough purees of peas, spinach, artichoke hearts and other vegetables should be given.

Perhaps the most useful treatment is exposure to sunlight. This must not be suddenly given for long periods of time; the child should be undressed and exposed to the rays of the sun for a few minutes several times a day; the time of exposure should be prolonged each day until he is spending a considerable part of each day in the sunshine. If sunshine is not possible, exposure to the ultraviolet light rays is almost as useful. This exposure should be carefully graded in order to prevent sunburn.

Change of climate is usually most desirable, but the poverty of a very great many of these children prevents this.

The deformities are more easily prevented than cured. The rachitic child should not be permitted to walk until the bones of the legs become firm. A large, thick diaper is responsible for many of the deformities of the bones of the thighs. The rachitic child must not be allowed to remain in one position for too long a time, and any habit of posture must be prevented if possible; these children have a habit of sitting cross-legged; this should be prevented. Massage and rubbing of the skin with some soft, bland oil is very helpful.

The correction of the kyphosis is best secured by suitable osteopathic treatments together with such exercise and massage as are indicated upon examination of the case. A careful straightening of the long bones may be secured by manipulation before ossification has become complete; after a child is about three years of age, the bones have become so rigid that manipulation can not be expected to accomplish very much in the way of straightening them.

Orthopedic surgery gives excellent results after the active stage of the disease has subsided. It is usually best to defer surgery until the child is at least four or five years old.

**Prognosis:** Rachitis is self-limited and the active stage rarely extends beyond the end of the second year. The bony deformities become diminished with time and the enlargement of the epiphyses may disappear entirely. The rickety rosary usually persists through life. Death does not occur from the rachitis, but the presence of rachitis adds seriousness to any intercurrent disease. Pulmonary diseases are much more fatal in rickety children on account of the imperfect expansion of the thoracic walls. The bony deformities very often result in weakness in later life; this is especially true of the pelvic deformities in the female.

## CHAPTER XLVI

### SPASMOPHILIA

(Tetany; Arthrogryposis; Carpopedal Spasm; Laryngospasm;  
Laryngismus Stridulus)

This is a disease which may be rather more common than is ordinarily supposed. It occurs most commonly between the sixth and eighth month of infancy.

Spasmophilia is characterized by an abnormal spasm of the striated muscles of the body, usually more marked in certain muscle groups than in others. Several different diseases have been described and it now seems probable that of all these are merely varying manifestations of the constitutional dyscrasia.

#### Etiology

The essential cause of this disease is not known. Some disturbance of the calcium metabolism is no doubt the essential feature. The disorder has been caused in animals by the removal of the parathyroids; in adults the disease is occasionally found associated with diseased parathyroids. It occurs very rarely in breastfed children. There seems to be some substance in the whey of cow's milk which disturbs the calcium metabolism in certain children. Just why it is that some children are able to take cow's milk with excellent results while others become subject to nutritional disturbances when fed upon cow's milk, no one yet has been able to explain. Bony lesions vary, but are always present. The lower thoracic spinal column is usually involved.

Spasmophilia is more common in children of neurotic heredity. It does not seem to be especially common in children who live in unsanitary surroundings. The electrical reactions characteristic of spasmophilia may be found in the very considerable proportion of children who have never shown any symptoms of muscular irritability. The disease is often associated with rickets and with status lymphaticus. It seems to be more common in children who have suffered from gastro-intestinal diseases than in others. The symptoms depend upon the location of the muscles affected.

#### Types of Spasmophilia

**Laryngospasm** (Laryngismus Stridulus) occurs many times in nervous children. It is characterized by spasm of the laryngeal muscles, which prevents inspiration. The head drops back, the child makes urgent efforts toward inspiration, the face and body may be covered with a cold sweat. The face, lips and fingers become purple



and a marked degree of cyanosis may occur. The child loses consciousness, voids urine and feces, the limbs relax, and the child seems about to die. Only the twitchings of the eyelids or the lips may indicate that death has not already occurred. Indeed, in some cases, the child does die. After about a half minute or two minutes relaxation occurs and inspiration is permitted; this is long and associated with a peculiar whooping sound, resembling that of ordinary croup or the inspiratory sound in pertussis; the next breath is somewhat difficult, and succeeding breaths are easier until respiration again becomes normal.

The attacks are preceded by some respiratory disturbance, such as laughing, crying, coughing, or by emotional storms, such as grief, anger, or fear. The attacks usually occur in the daytime, or upon awakening in the morning; in this the disease differs from ordinary croup, in which the attacks occur almost invariably at night.

Occasionally the spasm occurs at the height of inspiration. This is the more dangerous form. No crow follows the relaxation. When death occurs in an attack, it is due to heart failure and not to suffocation. Artificial respiration gives no relief in this case.

**Fits.** The convulsions of spasmophilia resemble the convulsions of eclampsia or epilepsy. These attacks are very irregular; there may be twenty each day for a time, or the child may pass into status eclampsia for some hours. Several months or a year may occasionally intervene between the attacks. Usually the attacks are preceded by indigestion or by the onset of some acute infectious disease.

In other cases the attack resembles that of epilepsy. Mild cases may show merely twitchings of the cheeks, face, eyeballs or eyelids. More commonly the face and limbs are involved in clonic spasms, and at least a momentary loss of consciousness can be distinguished. The eyes are open and staring. Frothing at the mouth is common and the child may bite the tongue and may pass urine or feces during the attack. Each attack lasts from one-half minute to three minutes; the muscular twitchings diminish slowly and finally cease. The child sleeps deeply after an attack, as in epilepsy. There may be short and mild feverishness after each attack.

The convulsions supposed to be due to indigestion, fright or other emotional shock are frequently cases of spasmophilia. There seems no doubt that many atypical cases of epilepsy, so-called, are due to the convulsions of spasmophilia.

**Tetany.** This is a peculiar spasm of the hands and feet in children. The attacks are usually paroxysmal, and may last only a few minutes or a few hours, or may persist for several days. A characteristic spasm affects the hands; the wrists are flexed and the hands turned somewhat toward the ulna, the thumbs are abducted strongly across the palm. The fingers are flexed at the metacarpo pharyngeal

articulations and are extended at the distal joints. The feet assume a similar position and the dorsum of the foot is bulged upward in such a manner as to resemble a cushion. The position of talipes equinus or equino varus may be assumed by the feet. Rarely the elbows, knees, hips and shoulders are effected by the spasm and are flexed and abducted. Still more rarely the trunk muscles are effected, but opisthotonus may be marked. The position of the hands is sometimes called "accoucheurs hands" or the "obstetrical position". The facial muscles are occasionally affected and the lips are pushed forward; spastic strabismus may occur; the head may be thrown backward as in meningitis. Rarely the muscles of the bladder become spastic with retention of urine. Edema is usually rather marked in the hands and feet after the spasm has occurred.

**Pseudo Tetany.** In this condition the muscles of any part of the body, or of the body in general become hardened and edematous with occasional attacks of very painful spasms. Children who suffer from this condition show a marked psychic irritability.

**Broncho Tetany.** A condition has been described in which there is spasm of the bronchial muscles. This produces symptoms resembling those of ordinary bronchial asthma. It is possible that some cases supposed to be asthma in children may really be due to bronchial tetany. In such cases as this the muscles of the body show the same electrical reaction as in spasmophilia.

Visceral spasm must sometimes be considered. Spasm of the pylorus may be of this type. Spasm of the anal muscles may cause very obstinate constipation.

**Muscular hypertonia** is probably a related condition. This occurs during the first half year of life. It always follows some very severe septic state, syphilis, or some other very prolonged disease of nutrition. The flexors are chiefly affected in this disease. Carpopedal spasm may be of this type. Retraction of the head and opisthotonos are frequently noted.

### Diagnosis

The electrical reactions of the affected muscles give the most definite information as to the real diagnosis. The first test depends upon the increased irritability to galvanic stimulation. This is called Erb's phenomenon. In a normal child when the electrode is placed over the peroneal nerve, no cathodal or anodal opening contraction can be produced with less than five milliamperes. In spasmophilia opening contractions are produced by a very weak current, even by one milliampere. In other words, with less than five milliamperes of galvanic current a cathodal opening contraction is diagnostic of spasmophilia. The median nerve at the bend of the elbow, the ulnar nerve or the peroneal nerve may be used in this test.

Chvostek's Sign consists in a rapid contraction of the muscles supplied by a nerve when the nerve is stimulated by a sharp tapping. The test is easy and requires no apparatus. A series of sharp taps are made with the tip of the finger over various parts of the outer part of the cheek; when the tap strikes a nerve trunk a sudden contraction of the muscles supplied by this nerve is noted. The muscles about the mouth are the most frequently effected, occasionally the muscles about the eyes are involved in the reaction. Chvostek's sign is most useful in infancy. It is not always present and in older children may not be elicited even in the presence of definite spasmophilia. In other words, if this sign is present spasmophilia is present; if this sign is absent the diagnosis is not necessarily affected.

Trousseau's Sign depends upon the fact that in any case of increased muscular irritability, compression of the nerve trunks of the upper arm causes the hand and arm to assume the position found in tetany. This sign is sometimes present in spasmophilia; when present it is pathognomonic. This sign is usually elicited by placing an elastic band around the arm over the bicipital muscle. The band should be tight enough to exercise a rather marked restriction upon the arm. In five minutes the hand assumes an obstetrical position. The band is sometimes painful in some cases and sometimes it elicits a laryngeal spasm.

If any one of the three tests just mentioned is present a diagnosis of spasmophilia may be made even if the symptoms are not marked.

### Treatment

The prevention of spasmophilia lies in good hygiene; that is, plenty of fresh air, good hygienic surroundings, maternal nursing. After the disease has become recognizable the same conditions are useful in treatment. If it is in any way possible, human milk should be provided for children with spasmophilia. If human milk can not be secured, goat's milk should be tried; if cow's milk must be used the whey should be eliminated. Milk casein with dextrimaltose can be prepared. The whey seems to be the most important part of the milk so far as the calcium disturbances are concerned. The carbohydrate proportion can be used alone for one to five days, even in rather small children. Orange juice, or some of the other vitamin-containing juices must always be administered to these children.

After the age of nine or ten months, cow's milk can be excluded almost or quite completely; cereals, eggs, beef juice, scraped meat, with an abundance of vegetables, vegetable juices, fruits and fruit juices should result in speedy relief.

Corrective treatments should be given as indicated by examination.

The calcium relations are not yet well understood, hence, whether it is or is not best to increase the amount of calcium in the food is a

question that can not yet be settled. Probably any child on a mixed diet receives enough calcium to provide all necessities. Certainly calcium excretion is present in normal children, in children with spasmodophilia, and in rickety children in varying amounts.

Codliver oil is frequently given, it contains rather more of the vitamin A than other oils.

Because of the fact that disease of the para-thyroids causes spasmodophilia in animals and in adults, the administration of para-thyroid extract has been tried in the treatment of children. It has not, however, seemed to give any satisfactory results so far.

For the convulsions a warm bath, which may be prolonged for an hour or more, gives the best relief. If the spasm is very severe and prolonged, the inhalation of ether may become necessary. A very small amount should be used and it should be mixed with air.

Laryngospasm usually requires no treatment. A child subject to either convulsions or laryngospasm should be protected from excitement and from change of temperature. If the attack seems very severe, sprinkling the face with cold water or pressing beneath the tongue with the finger may initiate inspiration. The attempts to secure respiration should be immediately discontinued when a single inspiration occurs, unless a second attack should supervene.

Usually the disorder persists for several years when treatment is omitted. Occasionally the spasms come and go irregularly and this fact makes it rather difficult to determine whether any child has completely recovered or not.

The danger of sudden death from heart failure must be remembered. Such children must be carefully protected from excitement and must not be allowed to over-eat. The diet must be kept as wholesome as possible. Sunlight, fresh air and regular bathing are important factors in bringing about a normal metabolism, which is essential to recovery.



## CHAPTER XLVII

### DIABETES MELLITUS

Diabetes mellitus is not a common disease of childhood, though a few cases have been reported during early infancy. It is characterized by a disturbance in the sugar metabolism, as a result of which sugar accumulates in the blood to an excessive amount and finally is eliminated in the urine. Wasting, the accumulation of certain organic acids in the system, coma and death usually result within a few months, in children.

**Pathogenesis.** The Islands of Langerhans in the pancreas are found degenerated in nearly all cases. Sugar metabolism is controlled by these cells, and in the absence of their internal secretion the cells of the body are unable to use the sugar of the blood and tissue fluids.

**Etiology.** The cause of the disease is not known. Lesions of the ninth thoracic vertebrae are known to disturb the circulation through the pancreas, in animals. In adults, such lesions are invariably found in patients with diabetes mellitus. In children, this lesion is usually, but not invariably, present.

Excess of carbohydrate food and over-indulgence in sweets has been supposed to be a cause of diabetes mellitus; during the very early stages of the disease as well as during the later, an inordinate hunger for carbohydrates is noted. No doubt this fact has often been responsible for the erroneous idea that the excess sweets caused the disease in certain cases. On the other hand, it seems that in adults the disease may be caused by excessive carbohydrate feeding.

Sex is not an important factor in children. Heredity seems to play an important part; a familial tendency is also occasionally observed. Children of parents with any serious chronic diseases may suffer from diabetes; syphilis, tuberculosis, gout, nervous disorders, especially with consanguinity of parents, are most often found.

Traumatic causes are rare. Blows upon the head, cranial tumors, and shock have been reported. Diabetes mellitus may show the first symptoms several weeks after a severe blow upon the head, or any serious emotional shock, especially a severe fright. Even in these cases some abnormal condition of the pancreas is usually found at autopsy.

**Diagnosis.** The first symptoms are usually vague. The child loses weight, often becomes inordinately fond of sweets, becomes fretful, and often complains of headache. Great thirst may be the first symptom noted. Nocturnal enuresis is common, and may be the first symptom noted. The urine is greatly increased in amount. Constipation is frequent. The skin is dry and harsh, and the mouth

is dry. The tongue is dry and of a bright red color. Wasting is rapid and ultimately becomes extreme.

The urine may reach two gallons in twenty-four hours. It is pale, acid, with a specific gravity varying according to the amount of sugar (glucose) present; usually about 1020. The amount of sugar in the urine varies from a mere trace to 10 per cent or more. A daily sugar excretion of six ounces is not rare in severe cases. The kidneys are often affected by the abnormal character of the urine, and albumin, casts and renal epithelium may be found. The renal disease does not reach a severe stage before death in uncomplicated cases. In late cases considerable amounts of acetone, diacetic acid, beta-oxybutyric acid and greatly increased urea and uric acid are found in the urine.

The blood contains twice the normal of sugar, or more. Because of the great water excretion the blood is greatly concentrated; the red cells may reach 7,000,000 per cubic millimeter. The hemoglobin is not increased to so great an extent, and the color index is low. Leucocytosis may be present, as the white and red cells are compared. The leucocytes have an unusual affinity for iodine. The chemical analysis of the blood may make the diagnosis clear before the glycosuria or the polyuria are present.

With the development of the disease further symptoms are noted. The disease progresses much more rapidly in children, and the younger the child the more speedy the course of the disease. Death usually occurs in a few months from the first recognition of the disease, and rarely the child lives more than a year. Griffith reports a case in which only eleven days intervened between apparently perfect health and death from diabetes mellitus.

Weakness and emaciation increase. Rather sudden loss of appetite, nausea, sometimes vomiting, pain in the epigastrium, an odor of apple blossoms in the breath and in the clothing of the child, and sometimes varying nervous systems may appear at intervals or suddenly. Coma usually follows a few or all of these symptoms. During coma the breath is long and deep, often sighing, and sometimes of the Chenye-Stokes type. Death is to be expected within a few hours or a few days after the coma appears.

Differential diagnosis is not usually difficult. Alimentary glycosuria is common in children. The sugar disappears immediately from the urine when the excessive sugar in the food is eliminated. Transitory glycosuria often appears during almost any gastro-intestinal disease, but the thirst, inordinate hunger, dry skin, rapid emaciation, and other symptoms characteristic of diabetes mellitus are not associated with glycosuria in these cases. Nursing babies often eliminate lactose with the urine; the chemical differentiation of lactose and glucose is not difficult.

**Treatment.** Such lesions as are found on examination should be corrected. Almost invariably lesions of the eighth to tenth thoracic vertebrae are present, or an increased rigidity is found affecting this part of the spinal column.

The disease is not usually recognized until sugar appears in the urine. The child should be placed upon a fast of twenty-four hours if possible, and, in older children, two or three days. The sugar should disappear from the urine within this time. Babies may then be given albumin water, or albumin milk, buttermilk, or some other sugar-free preparation. Human milk contains a considerable amount of sugar and breastfed babies usually require to have given them several feedings each day of sugar-free artificial food. The urine should be analyzed daily. Upon the reappearance of sugar, the carbohydrate of the diet should be diminished. After a few days of sugar-free urine, the amount of carbohydrate in the food may be increased by not more than five grams each day. Oatmeal jelly is often well utilized when other carbohydrates increase the amount of sugar in the urine. The utilization of fat is usually a difficult matter. Acidosis often results from an attempt to provide the necessary nutritive elements in the food by the addition of considerable quantities of fat. Upon the appearance of acetone or diacetic acid in the urine, the amount of fat must be cut down and the amount of carbohydrate increased; one or two spoonfuls of thin, well-strained oatmeal gruel may be given immediately.

If the child is first seen when the acidosis is well marked, intravenous injections of a hundred cubic centimeters of five per cent glucose solution may be given. This usually diminishes the acidosis speedily, and, although it increases the amount of sugar in the urine, it may save the life of the child until the progress of the disease can be stopped.

For older children the problem is less difficult. After the one to three days' fast, albumin water, meat broths, vegetable juices and eggs may be given. On the second day the four per cent vegetables, such as lettuce, spinach, celery, carrots, peas, string-beans, artichoke hearts and young onions may be fed. After five days of this diet, if the urine remains sugar-free, not more than twenty grams of oatmeal jelly or even gruel made from other cereals may be given. After five days of this mixed diet, if no sugar appears in the urine, baked apple, toast or buttermilk may be given to the child, or not more than the equivalent of fifty calories of carbohydrate food in any one day. After five days of this diet, if the urine still remains sugar-free, the amount of carbohydrate in the food may be increased gradually until the child is taking a normal diet.

The urine, or preferably, the blood, should always be analyzed upon the first appearance of increased thirst or diminished nutrition until the child has passed the age of puberty.

**Prognosis.** Early cases receiving immediate and careful treatment may be expected to recover. If the child is not seen until acidosis develops, death is probably certain; with immediate and very careful treatment a few such children may be saved. The younger the child, the more serious is the outlook. Little babies usually die. Older children have a better chance to live.

**Complications.** Even before it is possible to make any diagnosis of diabetes from the early symptoms, the child may show many boils or carbuncles. The chemical examination of the blood should always be made when boils appear in children. Gangrene, boils and other skin affections are rather less common in children than they are in adults. Convulsions may occur in children; these are very rare in adults.

### Diabetes Insipidus

Polyuria occurs in many diseases; early in nephritis, without other recognizable cause in neuropathic diathesis; as the result of free drinking of water, and in diabetes mellitus polyuria may be either slight or marked.

In a certain group of cases, however, the polyuria may reach remarkable quantities; the amount of urine passed may be as much as five gallons in twenty-four hours, but it usually is less than three gallons.

**Etiology.** The essential cause of diabetes insipidus is not yet known. The cases which have come to autopsy frequently show enlargement of the pituitary body. Sometimes this enlargement is due to hyperplasia and sometimes to the presence of some neoplasm. Intracranial conditions not due to the pituitary body sometimes cause diabetes insipidus, and occasionally some lesion of the pons or medulla seems to be responsible for the diabetes.

The symptoms are vague. The child complains of thirst, drinks very much water and sometimes suffers from mild digestive symptoms. Wasting may be slight or very severe. If the amount of water taken in is reduced the polyuria also is reduced, but the child suffers from thirst and his health is somewhat diminished if the water intake is kept at too low a point for several days. The urine shows low specific gravity and no sugar, or a very faint trace of sugar occasionally. The blood is concentrated, but otherwise normal.

**Treatment** is not very satisfactory. The amount of water should be limited to the amount necessary to keep the child comfortable. Thirst may be controlled by giving some fruit juice with the water. Any cause of malnutrition which may be found upon examination should receive attention.

The location of the pituitary body renders surgery difficult or impossible. An X-ray examination of the skull may show the location of the tumor and give some information as to the propriety of



surgical interference. In cases of polyuria not due to pituitary involvement the treatment must be devoted to the essential cause of the polyuria.

The administration of pituitrin has given good results in a few cases in which the pituitary body seems to be deficient in function.

**Prognosis.** Recovery is not to be expected, though occasionally tolerance is developed, and the child may live to normal old age with merely the necessity of drinking much water, and excreting more urine, than normal people do. More often emaciation and weakness increase, and some intercurrent disease causes death.

### MYASTHENIA GRAVIS

This disease is rather rarely found at any age. It does not appear until at about the age of twelve or later, and it may appear at any time before fifty. It is characterized by a peculiar fatigability of the striated muscles innervated by the bulbar nerves.

**Etiology.** In about 90 per cent of all cases the thymus has been found persistent, or hypertrophied, or the seat of some neoplasm. Exophthalmic goiter is occasionally associated with this myasthenia. It seems very probable that some disorder of internal secretion is at fault.

**Tissue changes** fail to explain the pathogenesis of the disease. The muscle fibers are found normal or slightly degenerated, and with groups of lymphocytes, with some plasma cells and mast cells intermingled.

**Symptoms.** The onset is gradual. Ocular changes are usually first noted. Ptosis may be marked or almost insignificant; it is usually bilateral but the eyes are not equally involved. Occasionally diplopia precedes other symptoms. Weakness of the orbital muscles causes diplopia, strabismus, and sometimes ophthalmoplegia externa.

Metabolism is always affected. Creatin is found in the urine. (Creatin is not normally present in the urine). Creatinin is lower in both blood and urine than normal; and the urinary calcium is increased. The blood sugar is subnormal, and the basal metabolism is lowered. The skin assumes a bronze color in many cases.

The muscles of the face, jaw, pharynx, soft palate and diaphragm may appear asthenic very soon after the facial involvement, or may be delayed for some months or years, or any one muscle or muscle group may not be involved in the process at all. Thus, it becomes impossible for the patient to whistle, smile normally, or display any facial expression of feeling. Mastication and articulation later become very difficult, perhaps impossible. The muscles of respiration, other than the diaphragm, are not commonly involved. The muscles of the neck, trunk and back are rather often involved, and

the head may hang forward and the body slump into awkward positions.

The muscles seem fairly normal after rest. Upon contraction, they become fatigued very speedily, so that it may be impossible to compel further activity by the greatest voluntary effort. Rest takes place very quickly. The "myasthenic reaction of Erb" is not always present. This means that the muscles are very speedily fatigued by the faradic current so that no contraction occurs; after a very short interval of rest they again respond. With the galvanic current, however, the muscles do not become exhausted; if the galvanic current is applied when the muscle has been completely fatigued by the faradic current, a normal contraction occurs. This reaction is constantly present when it is found at all.

Muscular atrophy never occurs, muscular twitchings are not found at any time. The tendon reflexes remain normal. Sensation and intelligence remain normal.

The differential diagnosis may present difficulties. Disease of the central nervous system, botulism and other poisons present digestive symptoms, pupillary changes, and other characteristic symptoms.

**Treatment** is of little avail. Cold must be avoided, and any fatiguing endeavors strictly forbidden. Excitement is harmful. In severe cases rest in bed is necessary. Massage and electrical treatments are contraindicated.

Cervical and occipital lesions may be present; these should be corrected very gently, avoiding any unnecessary handling of the muscles.

Several internal secretions have been used in treatment, sometimes with fairly good results. Roentgen-ray treatment of the thymus may lead to its return to normal size, and thus stop the further progress of the disease; the affected muscles do not recover. Pituitary, ovarian, adrenal and thymus extracts have been used; the number of these suggests that none is of first value. If any indication of disturbance of any ductless gland can be found, it may be well to administer its extract.

**Prognosis.** There is little hope for continued life, and none for recovery. Remissions and exacerbations follow one another for one or several years. Suffocation, choking or starvation lead to death, on account of the feebleness of the muscles of respiration and swallowing. The greatest length of life after the disease was recognized was seventeen years; usually death is not delayed more than two years. The younger the patient, usually the more speedy the death.

## PART VI. DISEASES OF THE BLOOD AND LYMPHATICS

### CHAPTER XLVIII

#### Introduction

After birth the blood formation in children is about the same as that found during adult life. The erythrocytes and granular leukocytes are formed in the red bone marrow. The hyaline cells are formed in the lymphoid tissue, including the spleen, for the most part; a few lymphoid masses are found within the red bone marrow.

The red bone marrow is well supplied with nonmedullated nerve fibers which enter the bones by way of the nutrient foramina. These nerves control the size of the blood vessels within the red bone marrow and some of them terminate in fine brush-like fibrillae among the hematopoietic cells. The activity of the red bone marrow in the various bones of the body is subject to the evil effects produced by disturbances of the nutrition of the body as a whole and also as the result of slight malpositions of the bones themselves and of the vertebrae in closest relation to the segments which innervate the red bone marrow. It is thus evident that the blood-forming organs are subject to the disturbing effects of bony lesions in several different locations.

Lesions of the bones themselves result in disturbances of their own nutrition.

Lesions of the fifth to tenth thoracic segments affect the digestion and absorption of food, thus affecting the quality of the blood and the ability of the hematopoietic cells to form erythrocytes and granular leukocytes.

Lesions of the lower thoracic vertebrae interfere with the activity of the kidneys and liver, thus certain toxic materials are permitted to remain within the blood stream and these also disturb the activity of the blood-forming organs.

The various internal secretions seem to have influence upon the formation of blood which is not yet well recognized. These also may be adversely influenced by bony lesions.

The excellent results following osteopathic treatment of children who suffer from the various forms of secondary anemia prove that these considerations of the influence of bony lesions upon the blood formation are not exaggerated.

### THE BLOOD OF NORMAL CHILDREN

#### Erythrocytes

At birth the blood is concentrated; the number of erythrocytes may reach six million per cubic millimeter or more. Within a few days the number falls to about five and a half million. After the

child reaches the age of two or three years a count of about six million erythrocytes per cubic millimeter is normal. During early life the erythrocytes vary in size more than is normal in adult life. Erythrocytes as small as three microns or as large as ten microns are not at all unusual. During the first two years of life normoblasts are occasionally found in the blood of normal children. Basophilic granules are occasionally found in the erythrocytes during childhood; these are not normally found after the age of three or four years. The number of erythrocytes per cubic millimeter of blood varies with remarkable rapidity during childhood; this is due to the rather rapid variations in water intake and in water excretion during vomiting, diarrhea, fever and other disorders.

### Leukocytes

The total number of white cells is higher during childhood. At birth the total leukocyte count may reach twenty thousand per cubic millimeter or more. Within a few days this physiological leukocytosis of birth disappears and for the first four or five years of life the leukocyte count averages about ten thousand per cubic millimeter. It may vary from eight thousand to fifteen thousand in normal children.

**Hyaline cells.** Of all these cells, the lymphocytes are most abundant. During the first year of life about sixty per cent of the white cells are lymphocytes. The percentage diminishes until puberty, when the adult cell relations are reached. The lymphocytes vary more in size and in staining reactions in children's blood than in normal adult blood. Large numbers of hyaline myelocytes may be found in the blood of normal children and may reach five to eight per cent of the total leukocyte count.

**Mononuclear neutrophiles** are more abundant during childhood. They may form ten per cent of the total leukocyte count during the first year of life and from two to four per cent of the total leukocyte count of a normal child before the age of puberty.

**Polymorphonuclear neutrophiles** are relatively less abundant during early childhood. For the first year twenty-five to thirty per cent of the total leukocyte count are polymorphonuclear neutrophiles. The proportions increase during childhood until at the sixth year about forty-five per cent, at the tenth year about fifty-five per cent, and at puberty about sixty per cent of the total leukocyte count is made up of polymorphonuclear neutrophiles. These cells, during childhood, appear younger than is the case in adult life.

The neutrophile nuclear average rarely reaches two during childhood, while the normal average during adult life is two and five-tenths. The nuclei are relatively larger and present more rounded outlines than do the nuclei of adult leukocytes.



**Eosinophiles.** These cells are more common during childhood than in adult life, occasionally making up seven per cent of the total leukocyte count in the blood of normal children. Occasionally their number diminishes to less than one per cent during childhood. The eosinophile granules are rather large and take the stain with avidity. Basophilic hyaline intergranular protoplasm is occasionally found in these cells.

**Basophiles** also are rather more abundant in the blood of early childhood. Their number should not exceed one per cent of the total leukocyte count.

**Myelocytes** are never found in normal adult human blood, but may be found in the blood of normal children. They may make up five per cent or more of the leukocytes of the newly born.

### POLYCYTHEMIA

This is a condition characterized by a marked increase in the number of erythrocytes per cubic millimeter of blood. It may be due to concentration of the blood, as in diarrhea, vomiting or sweating. Cyanosis due to cardiac disease is usually associated with mild concentration of the blood.

**Vasquez's Disease** is an abnormal condition in which the erythrocytes are greatly increased, often reaching eight million per cubic millimeter. The total amount of blood in the body also seems to be increased. The blood is unusually viscid. The spleen and the liver are enlarged, but whether this is due to the polycythemia or not has not been determined. The cause of the disease is unknown. No cases have been reported in osteopathic practice. Symptoms are those of cardiac inefficiency. The only treatment which has been reported to be successful is bleeding. From 50 to 300 cubic centimeters are taken from the cubital vein, according to the age of the child, and this is repeated as often as may be necessary to relieve the symptoms. This gives only temporary relief, and does not modify the inevitably fatal termination. The child may live several weeks, or even two or three months, after the blood changes become recognizable.

### LEUKOCYTOSIS

The number of leukocytes per cubic millimeter may be increased in children, as in adults, by infectious processes, acute febrile diseases, concentration of the blood and certain diseases of the blood-forming organs. The significance of an increased leukocyte count depends upon the differential relations of the cell groups.

**Neutrophilic leukocytosis** is characterized by marked increase in the number of polymorphonuclear neutrophils. It must be remembered that the neutrophils are lower in children than in adults, and that they vary according to the age of the child. Neutrophilic leukocytosis always indicates an infectious process. Pneumonia,

meningitis, appendicitis, empyema and any purulent condition are always associated with neutrophilic leukocytosis, unless the vitality of the child is so low that the leukocytic reaction does not take place. Neutrophilic leukocytosis is usually present in scarlet fever, smallpox, tonsillitis, splenic leukemia and rheumatism. It is absent or slight in measles, mumps, influenza, typhoid fever, malaria and tubercular diseases not involving the meninges. In the diseases not characterized by leukocytosis leukopenia (diminished number of leukocytes) may be found.

**Lymphocytosis**, an increase in the hyaline cells of the blood, is very common in pertussis, and may be present in malaria, typhoid fever and tuberculosis not affecting the meninges. In lymphatic leukemia the hyaline cells may reach a tremendous number. In the recognition of lymphocytosis the normally high proportion of hyaline cells in the blood of children must be considered.

**Eosinophilia** is characterized by an increased number of eosinophiles in the blood. They may make up 30 per cent or more of the leukocytes in the blood of children with asthma, intestinal parasites or any disease of the skin. Eosinophilia is marked in certain forms of leukemia.

**Basophilia** is rarely found in childhood, though the number of basophiles is normally rather greater in childhood than during adult life. Hyperthyroidism, exophthalmic goiter and certain other disorders of the internal secretions, not yet well understood, are associated with basophilia, and in certain forms of leukemia the basophiles may be increased.

## HEMOPHILIA

Hemophilia often manifests itself first in childhood, and is characterized by a peculiar tendency to profuse bleeding from apparently insignificant wounds. The hemorrhage often seems to be spontaneous, but it is probable that some slight injury usually initiates the bleeding. Children so affected are called "bleeders."

**Etiology.** The disease is almost invariably hereditary. The order of inheritance is peculiar. Males are generally affected, but the hereditary tendency is transmitted almost exclusively by the females. In other words, the sons of a bleeder are rarely affected, the daughters of a "bleeder" are almost never affected, but the sons of the daughters of a "bleeder" are usually affected; the sons of the sons are not affected. Many exceptions to this rule have been reported.

Hemophilia is not associated with any other hemorrhagic disease, and patients suffering from hemophilia are often in excellent health.

**Pathological** findings seem to indicate that the disease is due to a relative preponderance of antithrombin. The actual amount of antithrombin or the actual amount of prothrombin may be normal, increased, or decreased, but invariably the antithrombin is greater than the prothrombin.

**Symptoms.** Hemophilia is rarely recognizable until the child is two years old or more. It is usually first noted after some slight wound when the hemorrhage is severe and out of all proportion to its cause. Most commonly it is the drawing of the first teeth that causes the undue hemorrhage. Sometimes a slight bruise may produce a marked hematoma.

Spontaneous hemorrhages occur from the nose in a large proportion of the cases. The mouth, intestines, urethra and lungs may be the site of apparently spontaneous bleedings.

It rarely happens that a child bleeds to death as a result of his first slight wound. The child is likely to outgrow the tendency when he reaches the age of puberty; on the other hand hemophiliacs may attain old age, maintaining life only by great care in the avoidance of wounds.

In the case of women who are hemophiliacs, death is likely to occur at some early menstrual period, or at the time of parturition.

**Treatment.** Such lesions as are found should be corrected. At the time of the hemorrhages the attack of hemophilia may be met by the compression of the bleeding area, the application of ice, or the tying of the small vessel which is bleeding. The administration of lime and gelatin is frequently successful. No drugs are of any value whatever.

Transfusions of normal human blood give excellent results. The effects of these is rather transient, and the infusions require to be repeated at intervals of some months, or a year.

## CHAPTER XLIX

### THE ANEMIAS

#### Secondary Anemia

(Simple Anemia; Symptomatic Anemia)

As the name indicates, this form of anemia is due to recognizable etiological factors. The characteristics of secondary anemia depend to some extent upon the nature of its cause.

#### Etiology

Almost any disease which affects nutrition may cause secondary anemia. Several groups are recognized.

**Infections.** Several of the acute infectious disease of childhood cause marked anemia. Diphtheria, tuberculosis, influenza, pneumonia and pyogenic infections anywhere in the body cause anemia which may be mild or severe. Malaria, syphilis and typhoid fever cause secondary anemia which may become very profound, but which usually develops slowly.

**Intestinal parasites** may cause secondary anemia so severe as to resemble pernicious anemia. The hook-worm is one of the most wicked in this respect.

**Debilitating diseases**, such as rickets, chronic tuberculosis, chronic nephritis, chronic diarrhea, hereditary syphilis or any other long continued, wasting disease may cause anemia which is usually severe but may be rather mild. Children who have insufficient or incorrect food, or who are confined in poorly ventilated rooms, or who are overworked often suffer from a form of secondary anemia which is very intractable.

**Poisons.** Toxic anemias are not very common in children. Arsenic derived from the coloring matter of clothing, bedding or wall paper causes severe anemia. Lead poisoning may be due to drinking water from lead pipes or the ingestion of paint. Toys may be painted with lead paint, or paint buckets may be allowed to stand around where children are playing. Bullets were used to clean the bottles for the baby's milk, and the baby was poisoned by the small amount of lead which clung to the bottle. The anemia due to lead poisoning is very severe, and may resemble pernicious anemia in the blood picture.

**Hemorrhagic** anemia occurs in the newly born as the result of any marked bleeding during or after birth. In older children this anemia may be due to intestinal parasites or intestinal ulcers, to pulmonary tuberculosis with hemorrhages, hemophilia, purpura



hemorrhagica, scurvy or any other disease associated with hemorrhages. Traumatic causes of hemorrhage cause temporary anemia, but if the child is in good health this persists only a few hours or a few days, at most. Anemia due to many small hemorrhages may cause an anemia of very tedious recovery.

### Diagnosis

**Symptoms** vary according to the cause of the anemia. A single severe hemorrhage may cause death. Less severe hemorrhages may cause fainting, pallor, and shortness of breath. Chilliness and thirst follow fairly severe hemorrhages.

Within a few days after such a hemorrhage the blood returns to a normal condition.

In the presence of any of the causes of secondary anemia above mentioned, fairly characteristic symptoms are noted in addition to the symptoms due to the etiological disease. The child tires easily, the breath becomes short upon slight exertion, the muscles are flabby and soft, the child has little appetite and suffers from gastrointestinal disturbances upon slight provocation. The hands and feet are cold. Fretfulness, irritability, neuralgia pains, insomnia, headache and attacks of chilliness, which may be so severe as to suggest the rigors of malaria, occasionally are noted. The fatty tissue of the body is not usually diminished. A small amount of edema often leads to an appearance of plumpness.

Upon **physical examination** anemic murmurs may be heard over the heart and a venous hum is often found over the jugular veins. Dilatation of the heart may often be found; the spleen and the liver are usually somewhat enlarged. The lips and conjunctivae may be pale. The skin may show pallor or there may be a greenish or yellowish tint.

**The blood** changes may be either very gradual or very rapid, according to the cause of the anemia. The hemoglobin is usually reduced to 70 per cent of that normal for the age of the child in mild cases, and may reach 20 per cent or less in severe cases. The number of red cells is usually reduced in children, although occasionally an increase may be found. The color index is always low; the red blood cells are pale and are irregular in size. Poikilocytes are abundant. The leukocytes are not affected unless the primary disease is characterized by leukocytosis or by leukemia.

### Treatment

The treatment is that of the primary cause. The treatment for the anemia itself includes first the correction of such lesions as may be found which interfere with the nutrition of the red bone marrow anywhere in the body. Correction of the rigid thorax by means of short treatments of a somewhat stimulating nature are very helpful.

**The diet** of a child with secondary anemia must receive especial attention. All nourishing foods should be freely given. Indigestible foods, tea, coffee and irregular eating must be eliminated as speedily as possible. For most children a slight restriction in the carbohydrates is indicated and an increase in the raw, green vegetables, or vegetable juices, and in milk, eggs and meat is usually indicated. The administration of iron is often advised. The iron which is present in the form of hemoglobin, myohematin and chlorophyll is usually most easily built up into hemoglobin in the child's blood. These substances are present in meat and in the green vegetables, and if the diet is abundantly supplied with these the iron intake far exceeds the iron requirements of the body.

**Prognosis** is that of the primary disease.

### CHLOROSIS

This is one of the primary anemias. It is rarely seen before puberty and is usually associated with the puberty changes. Typical cases are found only in females, but before or during the years of puberty boys may suffer from a disease which bears a striking resemblance to chlorosis.

**Etiology.** The cause of the disease is not known. Among other factors which have been considered of etiological value are heredity, congenital hypoplasia of the arteries, copremia resulting from chronic constipation, edema of the blood, disturbances of the internal secretions of the ovaries, emotional disturbances and unhygienic living. The great range of these etiological factors indicates that the real cause of chlorosis is not known.

Bony lesions of the lower thoracic and upper lumbar region are always found. Cervical lesions are common. Rigid thorax is sometimes present.

**The symptoms** of a rather severe secondary anemia are present in these children. Palpitation of the heart, vertigo, attacks of syncope, edema of the feet, ankles and sometimes the face are usually present and may be severe. The color of the skin is characteristic. Pallor is marked and a peculiar yellowish green tint is usually present; this is most noticeable under the eyes and around the corners of the mouth and the nose. Perversions of appetite are very common; these girls tend to chew hair, eat chalk, clay and other improper articles. They desire an over amount of spices, sugar and salt in the food. In certain rare cases they eat feces and drink urine.

Emotional instability is usually marked; these girls are very hard to manage and they alternate angelic moods with attacks of anger, jealousy and irritability of a very different nature. Other girls show very little irritability and simply appear weary, languid

or lazy all the time. Neuralgic attacks, especially cardialgia, may be very severe.

**The blood** shows very low specific gravity, low hemoglobin and usually a normal number of erythrocytes and leukocytes. Among the erythrocytes are often found large, swollen, edematous cells, which are sometimes called chlorotic cells. The hemoglobin may reach 25 per cent of the normal or even less. Since the erythrocytes are slightly changed in number, if at all, the color index is invariably extremely low.

**Treatment.** Bony lesions of the upper lumbar region or of the eleventh or twelfth thoracic are always present, and lesions of the upper cervical region are common. These should be corrected. Treatment of any abnormal condition found in the body upon examination should be given at once. The existence of abnormal conditions affecting the ovaries should be corrected. Surgical interference should be avoided until this seems necessary to preserve life. It is very unfortunate that ovaries which are slightly cystic have been so often removed in this disease.

**The diet** should consist of abundant fresh vegetables and a rather larger amount of beef and other meat than is usually given children of the age of the patient. Constipation must be very carefully and persistently treated and frequent washing of the colon is an important factor in securing better intestinal action.

Exercise must be carefully graded in order to avoid over work of the heart. Abundant fresh air is necessary. Change of climate either from a high altitude to the sea level or from a low altitude to the mountains has given excellent results. Whatever habit of living can be found that is unhygienic, must be corrected.

### PERNICIOUS ANEMIA

This name is given to a group of diseases in which no cause can be found. It is a very severe form of anemia, progressive in type, usually fatal and characterized by certain typical blood findings.

**Etiology.** While the essential nature of this disease is not known, a number of factors have been considered important in promoting the disease.

#### Types

1. Certain anemias which present all the characteristics of the pernicious type have been found at autopsy to be due to primary diseases. Syphilis, rickets, and atrophy of the gastric mucous membrane have been found in these cases. The presence of the bothrioccephalus latus or of the anchylostoma causes an anemia which is not to be distinguished from the typical pernicious form in a large proportion of cases.

These conditions are, of course, merely unusually severe forms of secondary anemia, and are included in this discussion because the symptoms and the blood findings are so much like those of the typical form.

2. **Infection** with any of the pyogenic organisms may result in a metastatic infection of the red bone marrow. The streptococcus hemolyticus often gains entrance into the bone marrow, and this in some cases causes marked proliferation of the centers in which the leukocytes are formed with an associated aplasia of the erythrocyte-forming centers. These cases are rarely diagnosed during life and the essential cause of the condition can be recognized only at autopsy. An acquired form of aplastic anemia may thus be caused.

At autopsy the same changes are found in children as in adults. The red bone marrow may be irregular in consistency and many areas of dry bony trabeculae, with no sign of marrow, may be found in the flat bones. The fat and the muscles are pale, and various glandular organs may show fatty degeneration.

3. Aplastic anemia is frequently confused with the truly pernicious type. In this form there is a congenital absence, or at least a very early atrophy of the erythroblastic tissue of the marrow. The red bone marrow seems to be superseded by yellow bone marrow, even in the soft bones. A few areas of red bone marrow may be found but on examination these seem to be very poor in hematopoietic cells. The blood characteristics are usually pathognomonic. Erythrocytes are very much diminished but there are no cells indicative of regenerative processes in the red bone marrow. Normoblasts and megaloblasts are absent. Poikilocytosis, anisocytosis and polychromasia are very slight or absent. The hemoglobin is diminished and the color index is usually low, although this is not invariable. The granular leukocytes are greatly diminished in numbers; the hyaline cells remain almost or quite normal.

4. Typical Pernicious Anemia, Addison's Anemia, Biermer's Disease, Cryptogenetic Anemia.

**Hemolytic Anemia.** This form of the disease is characterized by conditions which suggest rapid disintegration of the erythrocytes with marked evidence of regeneration on the part of the hematopoietic cells in the red bone marrow. The red bone marrow undergoes marked hypertrophy; the yellow bone marrow is invaded by the red bone marrow and ultimately disappears completely. The spleen and the liver are usually somewhat enlarged and a marked deposit of iron is found in the liver cells; this condition is characteristic. At autopsy all of the viscera seem very bloody with abundant capillary hemorrhages. Fatty degeneration of the heart, kidneys, liver and the glands of the body is usually rather marked. The muscles are very deep red in color and the fat is dark orange, reddish orange, or greenish brown in color.



The cause of this disease is not known. Bony lesions are always present, but vary in location. The thoracic vertebrae and the ribs most commonly show lesions.

The hemoglobin is diminished while the erythrocyte count is still more greatly diminished; this causes a color index above one. The red blood cells do not form normal rouleaux. Poikilocytes are abundant, but megalocytes exceed them in numbers; normoblasts are usually less than megaloblasts. The alkalinity of the serum is increased in most cases. The resistance of the red cells is diminished. Viscidity is greatly diminished.

The granular leukocytes are considerably diminished in number and may include many myelocytoid forms. The hyaline cells remain about normal in number and in quality.

**Treatment.** Lesions are most marked in the thorax. These must be corrected. After a most careful search for a primary cause in cases which present the blood findings of pernicious anemia, if no such cause can be found treatment is largely symptomatic. The gastrointestinal tract must be kept well cleared out and an abundant, wholesome diet, especially rich in the green vegetables must be provided.

When it is remembered that iron is freely deposited in the liver and in certain other organs, the fallacy of administering inorganic iron is evident, the diet must be high in the vitamin-containing foods, although the disease is not considered one of the deficiency diseases.

**Prognosis.** The course of the disease is probably invariably fatal in typical cases. All that can be done is to prolong life and to maintain the comfort and strength of the patient as long as possible.

### SPLENIC ANEMIA

(Pseudoleukemic Anemia, Infantile Splenic Anemia, von Jaksch's Anemia).

This is a peculiar disease characterized by remarkable increase in the size of the spleen, and by blood findings suggesting pernicious anemia.

**Etiology.** These cases are most common during the second year of life, it is very rarely seen after a child has passed the age of three years. These children may have suffered from syphilis, rickets, digestive disturbances or improper feeding, but these conditions can not be considered the important factors in the disease because these diseases are usually followed by merely secondary anemia of varying degrees of severity. It has been considered the infantile type of myelogenous leukemia, but this does not seem to be in harmony with other findings.

**Tissue Changes.** The enlargement of the spleen is by far the most conspicuous finding. The liver is usually slightly enlarged and the lymphoid tissue may show a certain amount of hypertrophy. The bone marrow usually shows little or no change.

**Diagnosis.** The disease begins gradually with weakness, pallor, sometimes slight jaundice or gastrointestinal disturbances. Symptoms of rickets may occasionally be found. The child is weak, fretful, but does not usually show any emaciation. The abdomen becomes progressively larger. Fever is not often found. Dyspnea and cardiac dilatation are rather common.

Enlargement of the spleen is usually marked. It is hard, not tender, and may extend to the navel or even to the right crest of the ileum.

**Blood.** The hemoglobin is diminished but not to so great an extent as in pernicious anemia. The red blood cells are diminished but not to so great an extent as is the hemoglobin; the color index is usually low. The erythrocytes show marked changes; megalocytes, microcytes, poikilocytes and normoblasts are usually very abundant. Megaloblasts may or may not be present in great numbers. The granular leukocytes are increased, sometimes to fifty thousand or more per cubic millimeter. The lymphocytes vary but usually are not far from the normal number. Myelocytes are usually rather abundant.

**Treatment.** With our ignorance as to the cause and nature of the disease, treatment must be symptomatic. Such lesions as are found should be corrected. Constipation must be eliminated when this is present. The diet should be largely vegetable, with milk and eggs, and all hygienic conditions should be made as nearly normal as is possible.

**Prognosis.** The disease progresses very slowly; in about three-fourths of the cases a gradual but complete recovery results. These children are very susceptible to infections and they often die from bronchopneumonia, diarrhea or some acute infectious disease. In a few cases, the condition which seems to be a typical splenic anemia suddenly assumes the characteristics of leukemia and the child is very likely to die from this disease.

## - CHAPTER L

### THE LEUKEMIAS

(Leukocythemia)

The leukemias include a group of diseases which are characterized by a great increase in the number of white blood cells.

**Etiology.** Hereditary influences are occasionally present. Boys are rather more frequently affected. Any form of simple anemia, splenic anemia, syphilis, malaria, rickets or typhoid fever may be followed by the onset of some form of leukemia. In many cases it is not possible to find any etiological agent whatever.

**Tissue Changes.** In all forms the spleen is somewhat enlarged. In myeloid leukemia it may become so large as to reach the crest of the right ileum. The spleen and the liver are usually very red, soft and flabby. The capsule is thickened and adhesions to neighboring tissues may be present. The liver may be considerably enlarged. The lymphoid tissues of the body are usually hypertrophied. The bone marrow is always involved to some extent; it varies from a bright red or brown to a yellowish green color and many hemorrhagic areas may be present.

#### Types

Four well-marked types are described. Three types in which the symptoms and blood findings are atypical are usually classed with these.

**Acute myeloid leukemia.** This is a very rare disease. The child shows increasing weakness and occasionally a hemorrhagic tendency, especially marked in the mucous membranes. Occasionally ulceration of the mouth and throat precede the recognizable onset of the disease. Erratic temperature changes are noticeable. The fever may reach 104° F. within an hour, and disappear as speedily. These sudden sharp feverish attacks are not associated with any recognizable causative factors.

The blood examination shows marked myelocytosis. Sometimes one-half the total number of white cells is made up of myelocytes, usually neutrophilic. The white cells are not greatly increased in numbers, rarely above twenty thousand per cubic millimeter. The spleen is usually enlarged but not to the extent found in the chronic form. The course of the disease is rather rapid and death is to be expected within two or three months.

**Chronic myeloid leukemia.** This also is a rather rare disease. The onset is slow with a moderate degree of weakness and leukemia and with occasional feverish attacks. The fever may be absent or

may be so severe as to arouse the suspicion of pyogenic infection.

The enlarged abdomen may be the first symptom noted. The spleen may increase in size until it covers almost the entire abdomen. The liver is usually slightly enlarged; the anemic attacks become progressively more serious and death may occur from exhaustion. Edema and dyspnea are usually severe in the later stage of the disease.

Remissions are very common in myeloid leukemia and for this reason the prognosis is persistently doubtful even though the child may seem perfectly recovered from the disorder.

The blood is usually pale. The hemoglobin may be diminished to 30 per cent or lower, the erythrocytes are somewhat diminished and the color index is low. Polychromatophilia, basophilic degeneration of the erythrocytes, normoblasts and megaloblasts are present. Poikilocytosis and anisocytosis are not common. The most conspicuous factor in the blood picture is the enormous increase in the leukocytes. Of these, one-half or one-third are myelocytes. The large hyaline cells are increased; the small hyaline cells remain about normal. The basophilic cells are considerably increased. Eosinophiles and eosinophilic myelocytes are usually somewhat increased.

**Acute lymphoid leukemia.** Of all leukemias this type is most common in early life. Its cause is not known. The disease develops gradually with anorexia, variable fever, malaise, pain in the neck, back or other localities, weakness and anemia. Subcutaneous and submucous hemorrhages may occur before other symptoms have been noticed. The lymphatic nodes are enlarged; the cervical region is usually first affected. These glands are not hypersensitive and the skin over them is not reddened. The enlargement is not usually marked in any one node but nearly all of the lymphoid tissue becomes hyperplastic to some extent. The hemorrhages persist and become more profuse. Edema develops more rapidly than the loss of blood can explain. Leukemic infiltrations of the skin may form small tumor-like masses, and several forms of skin eruptions are common. In cases of rapid progress the mucous membranes and the gastrointestinal tract become swollen and ulcerated. Diarrhea is usually present. Toward the end, dyspnea and edema become serious.

The blood findings are characteristic. The hemoglobin is reduced to about 25 per cent of the normal, though the amount of hemoglobin varies. The red cells are greatly reduced, usually below two million. Normoblasts and megaloblasts are common. Poikilocytosis and anisocytosis are rare. The white cells are greatly increased, usually above two hundred thousand and sometimes above five hundred thousand. This increase in the white cells is due to



the remarkable increase in the small and large hyaline cells, which usually make up eighty or ninety per cent of the total leukocyte count. Remarkable fluctuations in the number of leukocytes in the blood are found and this may lead to an unwarranted cheerful prognosis.

No treatment is of any value. The X-ray is occasionally employed and this may lead to a remission. The diet and general hygienic measures are the same as in any other form of anemia. The progress of the disease is usually very rapid and death is likely to occur within two or three months.

**Chronic lymphoid leukemia.** This disease in its typical form has not been described for children. In a few cases prolongation of life with acute lymphoid leukemia has been associated with the development of symptoms resembling chronic lymphoid leukemia.

**Mixed leukemia.** In children irregularities in the cell changes in the various leukemias are especially noteworthy. Cases have been described in which the blood picture is that of the leukemias, but in which the total numbers of the white cells are not increased. The relative numbers of the groups of white cells and the great preponderance of myelocytoid forms make the diagnosis. The term "aleukemic leukemia" has been applied to some of these diseases.

**Chloroma** is a peculiar condition characterized by a sarcomatous growth which is found in the bone marrow and is most commonly present in the skull. This tumor is of a somewhat greenish color, hence the name. When it is present very marked anemia with a variable leukemia is found. The symptoms are chiefly referable to the blood condition and include weakness, emaciation, submucous hemorrhages, lymphoid hyperplasia and the erratic fevers characteristic of the leukemias. The tumor is prone to metastases and these affect the lymphoid tissues most severely. The course of the disease is very rapid and death usually occurs within two months.

**Leukanemia.** This is an atypical leukemia, usually of the lymphoid type, in which the red blood cells show the changes characteristic of pernicious anemia. It is very rapidly fatal and no treatment is of the least avail.

## CHAPTER LI

### DISEASES OF THE SPLEEN AND LYMPH NODES

The exact function of the spleen is not known. It performs certain useful duties, such as acting as a reserve of the excess of blood in the abdomen during digestion. It serves as an area for the development of blood cells during embryonic life, and it seems to be concerned in some manner, not yet well understood, in the formation of the hyaline cells of the blood and in the destruction of wornout red cells.

The structure of the spleen somewhat resembles that of other lymphoid tissue in the body. Its capsule contains many nonstriated muscle fibers which are innervated from the eighth to the twelfth thoracic segments by way of the splanchnic nerves. Lesions of the eighth, ninth and tenth thoracic vertebrae and of the corresponding ribs, especially on the left side, are often found in children and in adults who are subject to splenic enlargement, either with or without other etiological causes. The existence of such lesions seems to be a factor in localizing the pathological effects of certain infections in many cases.

#### ACUTE ENLARGEMENT OF THE SPLEEN

This condition is rather more common in early life than among adults. Any of the acute infectious diseases, typhoid fever, malaria or sepsis may be associated with an acute enlargement of the spleen. The condition is not usually the cause of recognizable symptoms, but the increased size of the spleen may be recognized upon physical examination.

Very rarely, during a severe attack of typhoid fever or malaria the spleen may rupture. The symptoms are those associated with any other type of hemorrhage into the peritoneal cavity. Immediate operation is necessary in order to save the life of the child. Rupture of the spleen is rare and for this reason is not likely to be suspected.

#### CHRONIC ENLARGEMENT OF THE SPLEEN

This condition also is fairly common in childhood. Any of the wasting diseases may cause the spleen to become considerably enlarged. Rickets, hereditary syphilis, malaria, tuberculosis, cardiac disease, anemia, leukemia and diseases of the liver are usually associated with moderate degrees of chronic splenic enlargement. Very rarely the spleen may be enlarged by tumors.

No serious symptoms are present on account of the splenic enlargement. A sense of weight and heaviness in the abdomen may

be noted and the size of the abdomen may be somewhat increased. In the leukemias, especially, the spleen may become of tremendous size.

No treatment is required for this condition further than the correction of the lesions already mentioned and the treatment of the primary disorder.

### GAUCHER'S DISEASE

This is a very rare disease, especially in childhood. It affects girls more than boys, and is a familial disease, although not directly hereditary. No cases have been reported in osteopathic practice.

The spleen is infiltrated with abundant masses of large, pale endothelioid cells. These cells infiltrate the liver, bone marrow and lymph nodes to some extent, though less noticeable.

The disease begins in childhood and it may be congenital. The first symptom noted is usually the great enlargement of the abdomen, due to the increased size of the spleen and to some extent of the liver. After a time, there may be noted some weakness and anemia. Submucous or subcutaneous hemorrhages are occasionally present. The resistance of the child is low and he usually dies from bronchopneumonia, diarrhea, or some other intercurrent disease.

**Treatment.** The only adequate treatment which has been reported is splenectomy. This usually results in improvement, which may or may not be permanent. Since the other tissues of the body also are infiltrated by the large endothelial cells, a hopeful prognosis can not be given in any case.

### HODGKIN'S DISEASE

(Pseudoleukemia; Lymphadenoma; Lymphatic Anemia).

This disease is rare, but is more frequent in childhood than during adult life. Boys are more often affected than girls.

The cause is not known. Since the disease so often follows vaccination or some infectious disease and since it is often associated with tubercular adenitis, some type of infection is to be suspected.

**Tissue changes** include the lymphoid tissue throughout practically the entire body. The nodes show marked proliferation of all types of cells. Giant cells, somewhat resembling those found in tuberculosis, are present. Eosinophile cells are very abundant. After the disease has been present for some months the connective tissue of these enlarged nodes becomes hyperplastic and the affected lymph nodes become somewhat smaller, hardened and almost white.

**Diagnosis.** The disease comes on gradually, with swelling of the lymph nodes, first of the neck. Then, very slowly, progressive enlargement of the other lymphoid tissue of the body is noted. The axillary glands are usually affected before the inguinal; the spleen

and liver are usually enlarged. At first the child seems as well as usual, but later a progressive anemia with weakness and cachexia supervenes.

The hemoglobin is diminished to about fifty per cent. The red cells rarely fall below two million. The leukocytes show no constant change: occasionally some leukocytosis, occasionally leukopenia, and occasionally an excess of eosinophiles may be found.

Irregular and variable attacks of fever are common. Pressure symptoms may be located in any part of the body; this depends upon the location of the lymph nodes most seriously enlarged. For example, if the inguinal glands are most seriously affected, pain and edema of the feet and legs result; if the mediastinal nodes are affected, cough or dyspnea may become a serious factor. Pressure upon the gall ducts may cause symptoms of jaundice; pressure upon the ureter may interfere with the outflow of urine and produce serious symptoms.

Pigmentation of the skin may be absent, slight or marked. The color is a peculiar brownish tint and may or may not be associated with lymphoid nodules in the subcutaneous tissue.

In the later stages of the disease, aching and tenderness in the bones, spleen or elsewhere, albuminuria, pericardial or pleural effusions, general or localized edema, tachycardia and great deformity due to the enlargement of the lymph nodes, are noted. The resistance of the body to infection is greatly diminished; boils, pruritis and eczema are common. Cachexia and emaciation are progressive. Death may occur from amyloid degeneration or from some intercurrent disease.

**Treatment.** Some good results have been noticed from the use of the X-ray. Surgical removal of the enlarged glands is usually followed by more rapid extension to other tissues. General hygienic and dietetic treatment is that of any wasting disease.

**Prognosis.** All treatment is unsuccessful so far as recovery is concerned. The life of the child may be prolonged and made more comfortable, but death is inevitable within two or three years. Occasional intermissions occur; at this time the size of the glands diminishes; fever disappears; the general health of the child is greatly improved. These intermissions lead to unbased hopefulness; they rarely last more than a month, and do not affect the inevitably fatal outcome.

### SIMPLE ADENITIS

Children are especially subject to enlargement of the lymph nodes upon slight provocation. Any of the acute infectious diseases may be associated with infection and enlargement of the lymph nodes. Anemic or weakly children are especially prone to such en-



largement. Any local infection may be followed by an enlargement of the lymph nodes which drain the affected tissue. The condition may be acute or chronic according to the nature of the bacteria responsible for the hyperplasia.

**The symptoms** noted naturally vary with the etiology in any given case. In purulent conditions, the lymphatic enlargement is usually strictly localized. In any generalized infection such as that of measles or scarlet fever, several chains of nodes are usually simultaneously affected.

The cervical glands are more often affected than others; this is due to the prevalence of inflammatory conditions involving the eye, ear, nose and throat. The glands are swollen, somewhat tender and they may be very painful. Unless suppuration occurs, the condition usually subsides with the disappearance of the primary infection.

Tubercular adenitis is discussed with tubercular diseases.

In suppurative cases, the enlargement of the glands persists after the subsidence of the primary inflammation. Children suffer from fever which may reach 104° F. or more. The affected node and the neighboring tissues become very painful and tender, the skin over the node is red and shining and the child seems very sick. If the gland is not incised it may rupture, either upon the surface of the body, in which case no harm results, or into deeper tissues, in which case very serious effects may be produced.

**Treatment** of any form of adenitis should include, first, the recognition of the primary infection. This should receive such treatment as is indicated. The drainage of the affected area should be encouraged by gentle manipulation, but no manipulation of the node itself should be employed. Either hot or cold applications may give relief. The use of poultices has been the subject of considerable discussion; it seems to increase the danger of suppuration, but it also aids resolution. When suppuration occurs and a local fluctuation is recognized upon palpation, or when pus is found accumulated in any one area, the abscess should be incised and drained. A single incision is usually sufficient.

**Prognosis** is very favorable for recovery, but the time during which the disease may persist is very variable. These nodes often remain swollen. When they are apparently almost ready to return to the normal condition a sudden increase in the severity of the symptoms with further suppuration may occur. In nonsuppurative cases several weeks may pass before the nodes return to the normal condition. In more favorable cases the nodes may remain swollen only a few days. Prolonged cases and especially those in which suppuration recurs may not return to the normal for a month or more.

The chronic form may supervene upon one or more attacks of the acute form, or the enlargement may be chronic from the first. Any bacteria of low virulence not sufficient to cause active reaction may cause chronic adenitis. Persistent enlargement of the lymph nodes may be noticed in the status lymphaticus or may be seen in children with the lymphatic diathesis.

### GLANDULAR FEVER

(Epidemic Adenitis; Infectious Adenitis)

This is an acute infectious disease whose infectious agent has not yet been described. It may be associated with influenza, or it may occur as a primary disorder. It is often found in epidemics which usually, however, affect only a small proportion of those exposed to it.

**Symptoms.** The onset is very sudden with high fever (105° F. or more), nausea, vomiting, and pain in the abdomen, limbs, neck and head. The cervical glands are enlarged, usually within a few hours after the height of the fever. Sometimes both sides are simultaneously affected; sometimes the involvement of one side precedes that of the other. The axillary and inguinal nodes, the spleen and sometimes the liver are enlarged. The affected nodes are very tender and swollen, but suppuration is rare. The cervical nodes may reach the size of a pigeon's egg, the enlargement of the bronchial nodes may cause pain under the sternum and various pulmonary symptoms. Usually the fever disappears within two or three days, but the enlargement of the nodes may persist for a month or more.

The treatment is that of idiopathic fever. Children should be isolated and the sick room disinfected after recovery.

Prognosis is excellent for recovery within a few days in typical cases.

## PART VII. DISEASES OF THE GENITO-URINARY SYSTEM

### CHAPTER LII

The kidneys are innervated chiefly from the eleventh and twelfth thoracic segments. These spinal segments are intimately related by means of association fibers with the ninth and tenth thoracic segments and the first and second lumbar segments. Secretory nerves to the glomeruli and tubules, and vasomotor blood vessels of the kidneys are controlled by these segments. Bony lesions of the eleventh and twelfth thoracic vertebra are often responsible for albuminuria and for the diminished resistance of the renal epithelium to bacterial infections and to the effects of the various irritating substances in the blood stream. Orthostatic albuminuria is in most text books of Pediatrics a puzzling problem. Our knowledge of the effects produced by bony lesions makes this condition easily explicable.

#### Examination of Urine

Urinalysis is as important in the diagnosis of children's diseases as it is of the diseases occurring during adult life. It is true that the respiratory and the digestive systems are more often diseased during childhood than are other physiological systems. For this reason the information to be secured by urinalysis has been overlooked by many pediatricians.

It is difficult to secure urine for examination in the case of infants, and even in older children there may be difficulty in securing an uncontaminated specimen. For male infants a bottle or test tube may be placed over the penis and held in position by pieces of tape fastened to the bottle at the neck and passed over the hips and under the perineum. A bottle with a rather large mouth may be fastened in the same way over the vulva of the girl baby. In both sexes, these methods may be used for older children who are unconscious, very weak or nervous.

A small amount of absorbent cotton laid over the penis or the vulva collects enough urine to make a few tests, as for albumin, sugar or salts.

Immediately after a baby awakens, it may be placed over a small vessel to urinate. The sound of running water or the touch of a cool hand or cloth over the lower abdomen may hasten urination.

In urgent cases, a child may be catheterized. A soft rubber catheter (size 6 or 7, American scale) should be carefully sterilized, the opening of the urethra sterilized, and the catheter inserted with care. Catheterization is to be avoided if possible.

### The Urine in Early Infancy

For one or two days after birth the urine shows the effects of the circulatory and digestive changes associated with the difficult period of adjusting intrauterine life to extrauterine life. A considerable amount of urine may be voided during birth or very shortly thereafter. For the first two days thereafter the amount of urine is small, rarely more than sixty cubic centimeters (2 oz.). This urine is dark in color and of high acidity. The urates are high and may render the urine turbid. Crystals of dark colored urates may be deposited on the diaper and thus lead to the incorrect assumption of hematuria. Albumin and sugar in small amounts are usually present. The inorganic salts are usually smaller than they are in later life. Bile is usually excreted in the urine at times during the first ten days of life. Mucus, amorphous granular matter, epithelial cells, hyalin and granular casts, crystals of uric acid and of urates are constantly present in the urine of most children for about forty-eight hours after birth.

After the first three days of life with the increasing food intake, the amount of urine increases constantly. On the sixth day from one hundred fifty to two hundred fifty cubic centimeters should be voided daily. The amount varies according to the liquid intake.

### Disturbances of Voiding

**Incontinence** of urine depends upon one or more of many different factors. The normal baby urinates voluntarily. Without any attempts at education, voluntary control of the bladder becomes established during the first two or three years. By training, this control is established much earlier, sometimes within the first ten months of life. Neurotic children often fail in establishing voluntary control for several years.

Upper lumbar lesions are frequent causes of incontinence. Phimosis of extreme degree, an impacted calculus, and cystitis are occasional causes of enuresis. Diseases of the nervous system, the coma of certain serious diseases or the sleep of profound exhaustion may be associated with temporary or permanent paralysis of the bladder. The urine may be dribbled constantly from a full bladder, or the bladder may empty itself at fairly regular intervals.

Anatomical abnormalities may, though rarely, cause incontinence. Extrophy of the bladder, opening of the ureters into the vagina, persistent urachus, absence of the sphincter vesicae and other even more rare deformities permit dribbling of urine.

**Pollakiuria**, or abnormally frequent urination, is usually present in polyuria, enuresis, cystitis, and certain neuroses. Abnormal acidity or abnormal concentration of the urine frequently so irritate the bladder as to initiate frequent emptying. Calculi may act in the same way.



**Anuria**, (Ischuria; oliguria) or lack of urine, may be due to one of two conditions. The urine may be secreted almost or quite normally, and retained within the bladder or elsewhere; or the kidneys may fail to secrete the urine in anything like a normal amount.

**Retention**, or dysuria, occurs under various circumstances. In the newly born this condition may be due to deformities, such as atresia of the labia or urethra. The urethra may be obstructed by calculi or by masses of uric acid crystals. Inflammation of the mouth of the urethra or the neighboring surfaces may cause retention, on account of the great pain of urination.

**Suppression** of the urine occurs when for any reason the kidneys fail to secrete urine. The newly born may not pass urine for a day, and the bladder may remain empty during that time. Uric acid crystals in the kidneys may account for this in some cases.

Acute nephritis may cause the secretion of urine to be greatly diminished, and even to cease altogether. Very marked diminution in the amount of urine may be caused by profuse, watery diarrhea, inanition, surgical shock, hysteria, and other less common conditions which diminish the amount of water in the system.

### Urinary Variations

**Reaction.** The urine is usually neutral, but may be faintly acid. Breast fed babies show usually less acidity than do babies on artificial diet. Considerable variation in the acidity often occurs, in the same child at different times and in different children under the same environment.

Normal constituents in the urine vary during childhood, for the most part according to the same factors as those which modify the urinary constituents during adult life.

The total amount of urine excreted during the day varies with the fluid ingested and with the amount of water excreted by the bowels, skin and lungs. The greater the total amount of urine, in general, the lower the specific gravity; the greater concentration is associated with the higher specific gravity. The following table has been calculated from the facts given in several recent textbooks:

Age	Amount	Specific gravity
First day.....	0 to 60 c.cm.....	1010-1012
Second day.....	10 to 100 c.cm.....	1010-1012
Third to sixtieth day.....	100 to 400 c.cm.....	1004 to 1008
Third month to two years.....	150 to 600 c.cm.....	1006 to 1012
Two to eight years.....	500 to 1200 c.cm.....	1008 to 1016
Eight to fifteen years.....	1000 to 1500 c.cm.....	1012-1020

The amount of urine varies according to the food. The newly born excrete about 60 per cent of the total food and water intake as

urine. Nurslings and runabouts excrete about 68 per cent to 70 per cent of the total food and water intake as urine. These percentages are varied with such unusual or abnormal conditions as increased heat, especially with low humidity; diarrhea, fever, sweating, and, indeed, almost any pathological condition.

**Uric acid** is higher relative to the amount of urea than is the case during adult life. The relation of urea to uric acid, 45 to 1, in the adult, may be as low as 20 to 1 in the urine of children who seem to be perfectly normal in every way.

**Urea** varies according to the amount of protein food. A child which takes one liter of milk with 1.5 per cent protein eliminates from 200 to 600 c.cm. urine, with about 5 grams of urea. With a high protein intake the urea increases both relatively and absolutely. The urea diminishes both relatively and absolutely upon a protein intake which barely meets the protein requirements. The urine produced during a fast contains high urea, and the proportion of urea to uric acid varies from the normal. Children on different diets eliminate the wastes of these diets as well as the products of metabolism of the body. These factors must be taken into consideration in interpreting the results of uranalysis in children.

**Phosphates** are retained by the needs of the ossifying bones. The amount of phosphates in the food should be greater than the amount eliminated by the kidneys and the bowels.

**Chlorides** are eliminated according to the chloride intake. A fault of the mixed diet given children is the presence of an excessive amount of table salt. Children whose diet contains an excess of salt usually show albumin, casts and renal epithelium in the urine at intervals without other recognizable cause. The urinary percentage of chlorides should not exceed 7 per cent in childhood.

**Sulphates** are found in the urine of children according to the diet. Usually the uric acid and the sulphates increase or decrease together. Eggs increase the amount of sulphates without adding recognizably to the uric acid output. The average amount is 1 per cent. Of this less than one-tenth may be the ethereal sulphates, usually estimated as indican, while the rest is derived from the proteid food.

Except for the phosphates, the inorganic salts of the urine during childhood are slightly lower than during adult life, and variations are due to the same dietetic and pathogenic conditions.

**Color.** Various colors appear in urine under varying circumstances. Concentrated urine is darker than normal; this may occur when insufficient liquid is taken, during attacks of diarrhea, during fevers however caused, and under other less common conditions.

Red or reddish yellow tints may be due to the presence of blood, uric acid or urate crystals, or bile. Greenish urine may be due to bile and greenish or bluish tints may be due to drug medication, especially the administration of methylene blue. Phenolphthalein causes a magenta tint in acid urine; eosin a pinkish tint with greenish fluorescence; fuchsin a reddish or purple tint. Brownish, smoky, or grayish urine may be colored by blood or bloody pus. White urine, cloudy or opalescent, may be due to pus, or to phosphate crystals in alkaline or neutral urine, or to globules of fat. After carbolio acid poisoning the urine may be almost or quite black in color.

Alkaptonuria is a rare abnormality in which the urine seems normal when voided, but becomes black or brown on exposure to the air. The condition is congenital, hereditary or familial, and is due to some metabolic disturbance in which there is inability to break up the benzene ring found in the derivatives of protein digestion. The elimination of homogentisic acid and the allied aromatic substances which darken with oxidation bears a quantitative relation to the proteids ingested. Occasionally alkaptonuria is associated with ochronosis and sometimes with certain joint disturbances, but usually no harm results from the abnormal metabolism.

**Acetonuria.** The increased elimination of acetone is usually associated with the elimination of diacetic acid and beta-oxybutyric acid. Acetonuria is most marked in late stages of diabetes mellitus. Disturbances of fat metabolism cause acetonuria, and in children this is usually due to deficient carbohydrate intake. Recurrent vomiting is usually associated with acetonuria. During starvation or fasting, pneumonia and other infectious fevers, and during attacks of intestinal intoxication, acetone is usually eliminated in abundance.

**Albuminuria.** After the first week of life, the urine of normal children on normal diet is free from albumin. Excess of proteid food, especially of eggs, may cause temporary alimentary albuminuria. Albuminuria due to posture or to lesions of the dorso-lumbar spinal column is not uncommon (see Orthostatic Albuminuria). Febrile albuminuria and toxic albuminuria are present during fevers and certain other diseases characterized by toxemia, and after the administration of certain drugs or serums. Adventitious albuminuria is that due to the presence of blood or pus, no matter of what origin. Disease of the kidneys is frequently associated with albuminuria.

**Cylindruria,** or the presence of casts in the urine, is often associated with albuminuria, especially in renal disease. Renal epithelium is also frequently present in the urine during renal disorders. A few cylinders and a few renal cells may be present as the result

of very slight disturbances, such as hunger, fatigue, exposure to cold or over eating. Emotional disturbances, even of slight degree, may be followed by the elimination of these elements, with or without an associated albuminuria. Rarely calcium compounds may be eliminated in the form of casts.

**Pyuria**, or the presence of pus in the urine, may be due to any one of several causes. The term should be applied only to those cases in which the pus is sufficiently abundant to produce recognizable clouding of the urine. In nephritis a few pus cells are always present. Pyelitis is rather a common cause of pyuria in children. Cystitis and urethritis are occasionally responsible for pyuria; these are commonly due to colon bacillus infection. Vulvovaginitis may be a cause of pyuria.

**Hematuria**. Erythrocytes may be present in such numbers as to give a smoky, brownish or reddish color to the urine. The color due to uric acid and the urates may resemble that of blood. The hemorrhagic diseases, sepsis, renal injury due to uric acid infarcts, calculi, or infections may cause hematuria. Hemophilia, leukemia, bilharzia, "black" or hemorrhagic forms of certain acute diseases, all may be associated with hematuria.

Idiopathic hematuria is rare. It is congenital and may be hereditary; the condition usually disappears within a few years, and it may occur in a few or many attacks. If the blood appears in the urine only at the beginning or at the end of micturition it probably originates in the urethra or in the bladder.

The determination of the source of the blood may present great difficulty. Blood casts certainly originate in the kidney. Small, thin shreds of blood may resemble casts but have pointed or ragged ends. Renal blood is not always associated with blood casts. Catheterization of the ureters may be necessary in order to determine whether the blood is from kidneys or bladder, and in renal disease to determine which kidney is affected.

**Hemoglobinuria** occurs when erythrocytes have been destroyed in considerable numbers. The urine is reddish or brownish in color. Albumin and a brownish granular precipitate are present. Casts are usually found. Rarely idiopathic hemoglobinuria occurs. It is paroxysmal, is due to no recognizable cause, and disappears within a few years after birth. Hemoglobinuria often follows severe burns, severe bruising, or poisoning by carbolic acid, arsenic, phosphorus, quinine, potassium chlorate, oxalic acid, or other less common drugs. Malaria, syphilis, parasites, and other causes of anemia may be associated with hemoglobinuria. The passing of hemoglobin-containing urine may be associated with constitutional symptoms, such as pain in the loins, headache, chills, feverishness, digestive symptoms, weakness, pallor, cyanosis, and, rarely, convul-



sions. The attacks are usually limited to a day or two. No ill after-effects are due to the hemoglobinuria, though the cause of the condition may be very severe or even fatal.

**Bacteruria** (Bacilluria) is a rare condition in which considerable numbers of bacteria are present in the urine when voided, and are found in the catheterized specimen. The term is not properly applied to those cases in which any considerable amount of pus is present. (The infectious agent is usually present in great numbers in pyuria). The most common of the bacteria present in bacteruria are colon bacilli.

**Glycosuria**, or the presence of sugar in the urine, is rather common among healthy children. The elimination of lactose among breast-fed babies is almost constant. The constant elimination of any considerable amount of sugar is indicative of some abnormal condition. Too great an amount of saccharose in the food of babies causes saccharosuria. Too great an amount of carbohydrate of any kind in the food of children may cause persistent glycosuria. These alimentary glycosurias are temporary, and disappear when the diet is corrected. Rarely pentosuria is found in children. Its cause is not known, and the condition is usually temporary and apparently harmless.

The constant elimination of considerable amounts of glucose by children on a normal diet is a symptom of diabetes mellitus (q.v.).

It must be remembered that other copper-reducing substances may be found in the urine of children, and that a diagnosis of diabetes mellitus must not be made upon the finding of sugar in the urine only occasionally, or in the urine of children upon high carbohydrate diet.

**Indicanuria.** The urine of breast-fed babies rarely contains indican. Babies on an artificial diet often eliminate small amounts of indican, even when no symptoms of indigestion can be noted. Always, the presence of indican indicates the absorption of the products of protein decomposition. Constipated babies and children absorb the products of the decomposition of proteid foods, and this, as indoxyl or skatoxyl potassium sulphate, is eliminated in the urine.

Indoxyl and skatoxyl are toxic in any recognizable amounts in the blood, and cause headache, somnolence and irritability. This toxemia may be responsible for much of the "badness" of children. The treatment is that of the cause; and, as in all toxemias, the administration of abundant water and such dietetic modifications as may be indicated by a study of the case.

**Lithuria.** An excess of uric acid may be found in the urine during fevers and during convalescence from any serious disease, during indigestion from any cause, and sometimes without recognizable cause. Newly born babies excrete more uric acid than do

older babies or children, and children excrete more uric acid, compared with the urea output, than do adults. The presence of uric acid crystals in the urine is not to be considered as an excess of uric acid elimination, since increased acidity of the urine may cause a precipitation of uric acid crystals from urine of normal uric acid content. In order to determine that an excess of uric acid is excreted, the analysis of the 24-hour specimen is necessary.

Accumulations of these crystals, whether due to uric acid excess, to their precipitation from scanty, concentrated urine or from urine of high acidity, may cause injury to the kidneys and hematuria, or they may pass through the ureter or the urethra with difficulty and great pain. Attacks supposed to be colic may be due to the passage of uric acid crystals. Uric acid infarcts in the kidney may cause renal disturbances; these are not usually serious.

**Urobilinuria.** Breast-fed children rarely eliminate urobilin in the urine, but it is present in small amounts in the urine of children fed upon other foods. It appears in increased amounts during acute intestinal diseases, in severe anemias, severe febrile states, and the hemorrhagic diseases.

**Diazo reaction.** This is not present in the urine of normal children nor during the ordinary children's diseases except measles, typhoid fever, and active tuberculosis. Rarely, other infections may cause a positive diazo reaction.

**Ferric chloride reaction** is positive when certain drugs have been administered, such as the salicylates, the coal-tar derivatives and a few other drugs. This reaction occurs in urine to which ferric chloride solution acid has been added. The color persists on boiling and appears in urine which has been boiled. Thus the difference between drug effects and diacetic acid is indicated.

**Ammoniacal urine.** The strong odor of the urine of some children is due to ammoniacal decomposition. Children with acidosis may void urine which is already high in ammonia content. In cystitis also there may be decomposition of the urea and other nitrogen compounds with the formation of ammonia.

In almost every case, however, the ammoniacal odor is due to the presence of alkaline substances in the diaper. Ammoniacal decomposition is greatly hastened by this alkali, and the odor may appear very speedily. The use of diapers which are thoroughly rinsed usually terminates the disorder. Ammoniacal urine is rarely found in hospitals, where the diapers are rinsed very thoroughly.

## CHAPTER LIII

### THE NEPHRITIDES

Recently an attempt has been made to distinguish between the nephropathies and the nephritides; that is, between those cases in which the renal disturbance is due to toxic influences, and those in which the same infectious agent is present in the kidney. If it is granted that inflammatory changes vary greatly in degree, and that inflammatory reaction occurs as the result of injury due to any cause, the term nephritis remains fairly accurate.

The classification of the various forms of nephritis is difficult, since neither etiological, pathological, symptomatic nor prognostic factors can be satisfactorily arranged so as to make a definite classification. From the kidneys which seem normal except when affected by abnormal posture or diet to those which show destructive changes there is an unbroken series of progressive pathological events.

The simplest form of renal disturbance is that found in about one-fourth the children examined frequently and carefully, after wearying exercise, and in a smaller number of children at intervals, without recognizable cause. It is characterized by the presence of albumin in the urine, rarely associated with casts and renal epithelium. Tubular nephritis is more serious, and glomerular nephritis still more serious in symptoms and in prognosis.

#### ORTHOSTATIC ALBUMINURIA

(Cyclic Albuminuria; Orthotic Proteinuria; Functional Proteinuria;  
Intermittent Albuminuria; Postural Albuminuria;  
Lordotic Albuminuria).

This condition presents considerable difficulty to those who fail to recognize the osteopathic relations of the kidneys. A brief review of the anatomical facts may facilitate an understanding of the condition.

The kidneys are controlled chiefly by nerve impulses which originate in the spinal centers in the eleventh and twelfth thoracic segments. These spinal segments are intimately related by means of association fibers with the ninth and tenth thoracic segments and the first and second lumbar segments. Secretory nerves to the glomeruli and tubules, and vasomotor blood vessels of the kidneys are controlled by the centers in these segments. Bony lesions of the eleventh and twelfth thoracic vertebrae are often responsible for albuminuria and for the diminished resistance of the renal epithelium to bacterial infections and to the effects of the various irritating substances in the blood stream.

Children who suffer from orthostatic albuminuria show a tendency toward a dorso-lumbar kyphosis. In such children, the spinal abnormality thus produced is a bony lesion which disturbs the circulation through the kidneys and produces albuminuria of the same type as that which is produced in animals by the experimental partial ligation of the renal veins.

Children who suffer from this type of albuminuria secure sufficient rest during sleep to allow the kidneys to return to almost or quite their normal condition. Autopsies performed on these children, therefore, show no evidence of tissue change.

In many children who present no evidences of ill health slight albuminuria, cylindruria or other evidences of slight renal disorder may be found upon urinalysis. While these slight and apparently functional renal disorders seem not to affect the child in any recognizable manner, it must not be supposed that the condition is therefore harmless. The reproductive powers of the renal epithelium are not unlimited. The nutritive loss due to the presence of albumin in the urine may be slight but it is not negligible. The child who suffers from orthostatic albuminuria or from the effects of any other type of vertebral lesions of the lower dorsal area, is much more likely to suffer from renal disease during the progress of any acute infection than are normal children. Since the recuperative powers of the kidney are limited, it is evident that the child who suffers from any cause of renal disorder is the most apt to exhaust the recuperative powers of the kidneys during early life and hence to suffer from renal disease during middle life.

**The diagnosis** is definitely determined by analysis of the urine produced while the child is standing, sleeping, resting and playing. The lesions are recognized by the usual osteopathic methods of examination.

**Treatment.** Correction of the lesions as found on examination is the most important factor. Treatments should be given daily until some change in the abnormal tissues is found, and then at progressively lengthening intervals until the condition is completely normal. After this the child should be examined every few weeks for a year or more, in order that any slight abnormality may be immediately corrected.

The diet should contain the lowest amount of nitrogenous food consistent with nutrition. Milk is usually the most satisfactory proteid food. Abundance of vegetables and fruits is required. If the child cannot handle vegetables or fruits either raw or cooked, their raw juices may be administered, diluted according to the digestion and the age of the patient.

The child should be made to lie resting for ten minutes or so several times each day, and every child so affected should have a



daily nap, if this is possible. Such children ought not to play too strenuously. Fatigue of any kind is harmful to them.

### DIETETIC ALBUMINURIA

Aside from the bony lesions, dietetic indiscretions are the most serious causes of the cyclic albuminurias of childhood. It must be remembered that the kidneys excrete the nitrogenous wastes of the body, the inorganic salts and the water. Moderately increased excretion of water seems to add nothing to the labor of the kidneys.

The excretion of the normal nitrogenous waste does not act adversely upon the normal renal epithelium. Kidneys which have been injured in any way may be unable to excrete the normal nitrogenous wastes without suffering detrimental effects, hence the necessity of keeping the nitrogenous intake at the lowest level in children who suffer even slight renal disturbances.

The excretion of inorganic salts in increased concentration does injure the renal epithelium. Sodium chloride intake in any amount beyond the smallest dietetic requirement is followed by the excretion of renal epithelium, and tends to the early exhaustion of the recuperative powers of the renal epithelium. Other inorganic salts used as medicines exert a more evil effect than does sodium chloride. Magnesium sulphate and other purgative salts; the small amount of potassium nitrate which is swallowed when given as a gargle for sore throat, and other inorganic compounds included in the term "simple home remedies" cause desquamation of the renal epithelium, often the excretion of serum albumin, and other evidences of renal disturbance.

Turpentine is often rubbed upon the chest or elsewhere; alcohol rubs are often given as a part of the "home treatment" of acute diseases. Both these drugs are inhaled and reach the blood stream by way of the lungs. Renal irritation invariably results, though perhaps of such slight degree that only a careful uranalysis indicates the effects of the poisonous drugs.

With every such occurrence there is some desquamation of renal epithelium, which is immediately replaced by new cells. Thus no evil effects are immediately recognizable. But the formation of new cells by the kidney is limited, and every time the renal epithelium is destroyed the recuperative powers of the kidney are diminished to some extent. Any acute infectious disease may then be more seriously complicated by renal diseases than if the kidneys had remained normal. Whether such effect is produced during childhood or not, a foundation is laid for renal failure during middle life or early old age.

Here also it must be remembered that vertebral lesions diminish the power of the kidney to meet adequately the demands made upon them by infections, toxemias, dietetic errors or poisons.

**Symptoms.** Children suffering from this type of renal instability are usually poorly nourished. They may suffer from constipation or other gastrointestinal disturbances, or they may show no symptoms whatever. More often the child shows diminished interest in his play or his school work and seems sleepy and weary during the day. Dizziness, sleepiness, anorexia, vomiting, palpitation of the heart, and muscular pain are very frequent symptoms of renal instability. Erythema, urticaria, dicrotic pulse and anemic murmurs are less common symptoms, but they are not rare.

**Diagnosis.** In order to make the diagnosis, the urine must be examined at different times of the day. The urine voided in the morning, that voided for two hours after the most highly nitrogenous meal of the day, that voided after the child has been in the erect position for as long a time as is comfortable for him, and the urine voided after rest in bed should be collected. All these should be saved in separate bottles and should be examined for albumin, casts and renal epithelium. The results of these examinations indicate whether the child suffers from digestive, orthostatic or permanent albuminuria and should also give some information as to the extent of renal disease or the existence of any definitely functional disorder.

**Treatment.** This condition should receive immediate attention. Lesions of the lower thoracic region should be corrected as speedily as possible without causing any further irritation of the spinal centers which control the kidneys. If the spinal column is so weak that the child shows lordotic tendencies when in the erect position, carefully planned exercises should be outlined. The parents must be persuaded to see that these exercises are persisted in until the spinal muscles have become strong enough to hold the child in a normal position whether he sits, stands or is recumbent.

The amount of protein in the diet should be kept at a level rather lower than that given to a child of the age of the patient. Carbohydrates and fats must be increased in order to maintain nutrition. An abundance of fruits and of raw and cooked vegetables should be given. Milk is an excellent food. The liquid intake should be rather more abundant than that provided for a normal child of the same age as the patient. Over-exertion is to be avoided. Emotional storms and any forms of nervous excitement are to be eliminated as completely as possible.

**Prognosis.** The functional, dietetic and postural albuminurias, if neglected, are apt to persist, with increasing renal disease, until a chronic nephritis is developed. Any intercurrent disease is very apt to be complicated with renal disorder. With correction of the vertebral lesions, the abnormal posture, the improper diet, or the other causes of albuminuria, the condition passes away within a week or a few weeks, and no evil after effects are found.

## ACUTE NEPHRITIS

(Acute Parenchymatous Nephritis; Acute Bright's Disease; Acute Croupous Nephritis; Acute Catarrhal Nephritis; Acute Desquamative Nephritis; Acute Nephropathy; Acute Tubular Nephritis; Acute Glomerular Nephritis, or Nephropathy; Acute Diffuse Nephritis or Nephropathy).

Two types are recognized. In the milder type, which is usually called tubular nephritis or the water-salt type, the excretion of the water and the inorganic salts is subnormal. The chemical analysis of the blood shows high chlorides, but normal nitrogenous content. The nitrogen elimination remains normal, or nearly normal. Albumin, casts and renal epithelium may or may not be found on examination.

In the more serious type, which is called glomerular nephritis or anazoturia, the water, inorganic salts and the nitrogenous wastes are all subnormal. The chemical analysis of the blood shows increases in the chlorides and the non-protein nitrogen. Albumin, casts and renal epithelium are usually found in the urine, and may be present in marked degree.

## MILD NEPHRITIS

(Tubular Nephropathy; Febrile Albuminuria; Water-Salt Nephropathy; Toxic Albuminuria).

The milder forms of renal disease are included in this group. The tubules of the kidney, affected by toxic substances, undergo degeneration, epithelial cells and casts are excreted in the urine, and recovery takes place by the multiplication of neighboring cells.

**Etiology.** Lesions of the lower thoracic vertebrae are predisposing factors. Febrile albuminuria is associated with fever; the high temperature of the body and the toxic substances derived from abnormal metabolism and from bacteria cause the renal injury.

Toxic nephritis or albuminuria is due to disturbed metabolism of the body, however produced; to the bacterial products, and, more frequently, to substances given as drugs. Turpentine and alcohol are often used as rubs; the fumes of these drugs reach the blood through the lungs, and are ultimately excreted by the kidneys, with more or less injury. Cantharides, arsenic, lead, salicylic acid or the salicylates, potassium chlorate and magnesium sulphate are some of the drugs which are often used ignorantly and which affect the kidneys adversely.

**Diagnosis.** Mild types of tubular nephritis cause no recognizable constitutional symptoms. More severe cases are characterized by edema, oliguria, pallor, weakness, diarrhea and anorexia.

Uranalysis shows diminished excretion of water and the inorganic salts, and blood analysis shows retention of the chlorides.

The nitrogen elimination remains normal, and there is no retention of the non-protein nitrogen in the blood.

In mild cases the water-intake and the urinary water should be compared. It must be remembered that a certain amount of water is eliminated by the skin and the lungs. Comparison of the salt-intake with the urinary salt (sodium chlorides) gives information as to the retention of the inorganic salts. Chemical analysis of the blood, showing increased chlorides with normal nitrogen compounds, makes the diagnosis positive.

**Treatment** of mild cases of nephritis consists in the correction of the lesions, always present, in the lower thoracic region, and the treatment of the causative factors. Drugs must be omitted, and the mother or nurse taught their evil influence. The acute infectious fevers must receive such treatment as is indicated for them. The older child need not be kept in bed, in mild cases, but he must not be permitted to become unduly fatigued. As much water should be given as is completely eliminated in the urine; it must be remembered that some of the water taken in is eliminated as perspiration and as the moisture of the breath. Salt should be omitted completely from the food.

The diet outlined depends upon the age of the child. The water used in preparing the food of infants must be determined with reference to the renal function of excreting water. In order to diminish the tendency to more serious disease, the amount of protein food should be kept at a low level. Meat is absolutely forbidden. Milk is the best protein-containing food, for babies or for older children. The required calories must be made up in carbohydrates. Gruels are good for this purpose; any cereals may be used.

**Prognosis.** A moderate renal involvement in the acute infectious diseases does not modify the prognosis of that disease, and if proper treatment is given, no further renal involvement is to be expected after the acute infection has cleared up. Any marked renal disease occurring during the course of the acute infection does cloud the prognosis of that disease, and there is great danger of serious kidney injury, which may persist and ultimately become fatal.

Toxic and febrile nephropathies clear up with the removal of the etiological agent. Unless the causative factor has persisted for a considerable time, no further injury is to be expected. It must be remembered, however, that any of these renal disorders, apparently with complete recovery, do lessen the recuperative powers of the kidney to some extent.

## DIFFUSE NEPHRITIS

(Glomerular Nephritis; Anazoturia; Serious Nephritis).

Inflammation of the glomeruli is always associated with some degree of inflammation of the tubules, hence the use of the term



“diffuse”. Several subdivisions are found, which differ very slightly in their symptoms, and not at all in treatment. They are recognized only at autopsy, if they are recognized at all.

**Capsular glomerulonephritis.** When the inflammation is almost or quite limited to the capsule, the condition is called capsular glomerulonephritis. When there is an exudation of serum into the capsule, with or without the emigration of leukocytes and the coagulation of the fibrin, or the development of small hemorrhages, the term “exudative” is employed. When there is marked increase in the endothelial cells within the capsule, the condition is called “proliferative”. Marked hemorrhages may occur, in which case the term “hemorrhagic” is applied.

**Intercapillary glomerulonephritis** is characterized by inflammatory changes among the capillaries of the tuft. At first the exudation of fibrin is alone found; later there are many leukocytes within the meshes of fibrin; later still there is proliferation of the endothelial cells. The pressure produces a variable amount of occlusion of the capillaries. The various combinations of cells, fibrin and debris may fill the tubes, which, in turn, undergo degeneration and inflammatory changes.

In favorable cases the exudate is digested and absorbed, leaving a kidney which is almost or quite normal.

In other cases the organization of the exudate results in a sclerotic or scar-like condition. The pressure of this sclerotic area causes atrophy of the renal epithelium, and the entire kidney may suffer very serious injury.

When these changes are associated, as they usually are, with a slow inflammatory reaction, the condition becomes chronic.

“Contracted white kidney” ultimately is formed by the progressive series of inflammation and sclerosis.

**Etiology.** Scarlet fever is the most common cause: any of the acute infectious diseases may cause nephritis of the glomerular or the diffuse type. Pneumonia is often associated with nephritis. Angina, bronchitis, any pyogenic infection anywhere in the body; almost any serious skin disorder, such as erysipelas, impetigo contagiosa or burns of considerable extent; poisoning from lead, arsenic or the coal tar drugs, syphilis, acute gastrointestinal diseases, and exposure to cold are occasionally etiological factors.

Lesions of the lower thoracic vertebrae are important predisposing factors. The child with such lesions suffers from nephritis upon slight exposure, slight attacks of the acute infections, and so on. An attack of measles is not usually provocative of nephritis, but the child with lower thoracic lesions, being attacked by measles, is almost certain to suffer also from nephritis.

**Diagnosis.** The symptoms vary. Nephritis may seem to begin with the scarlet fever or other infectious disease. Pallor and weakness may be the only symptom, and these are often attributed to the primary disease. Edema or hematuria may first arouse suspicion of renal disease. Uremia usually follows the edema. Dim vision, headache, vomiting, diarrhea, stupor, convulsions and suppression of the urine are present only in rather severe cases.

Edema is usually first noticed around the eyes. The feet, legs, scrotum and loins are then edematous, and general anasarca may

be found. Hydrothorax and ascites are common; hydropericardium occasionally occurs. Edema of the glottis may cause death from suffocation.

Uremia may be more marked than the edema. This probably depends upon the more marked glomerular disease, with only slight tubular involvement. Vomiting is, in children, the most important symptom of uremia. Headache, dimness of vision, diarrhea, convulsions, fever, coma, may follow within a few hours or a few days. Children are rather less seriously affected by similar grades of uremia than are adults, and they recover more quickly and more completely than do adults with what seems to be identical grades of renal destruction. In children the recuperative powers of the kidney are not exhausted, hence their speedy recovery.

Fever is usually present. The temperature rarely exceeds 102° F.

Urinary changes are important in diagnosis. The water, inorganic salts and nitrogenous wastes are all lower than normal in the urine. Albumin is present after the first day, and occasionally albuminuria precedes other symptoms. Blood cells and hemoglobin are present; these may color the urine smoky, reddish or bright red. The specific gravity is always low, though the total elimination of urine may be far below normal. Casts are abundant, hyaline, granular and blood casts may be found.

Inorganic salts are usually greatly diminished, since the tubules are affected also. Water retention is always present, and there may be total suppression for a day or more.

Blood analysis gives useful information as to the functional activity of the kidneys. Non-protein nitrogen, chlorides and water are retained in the blood.

**Atypical forms** are often found, especially in little babies. In some cases the symptoms suggest purulent inflammation, but at autopsy glomerulonephritis is the only pathological condition found. In these cases edema is late or absent. Nervous symptoms are usually severe,—restlessness and muscular twitchings are early symptoms; apathy and stupor follow and persist until death. The urinary findings are not indicative of severe renal diseases,—slight diminution, a small amount of albumin, blood, a few casts and cells from the renal epithelium. After a week or several weeks, death usually occurs. Rarely, after a long and eventful convalescence, the baby may recover.

Especially after or during scarlet fever, there may be sudden high fever, pain in the back and loins, rapid, full pulse, restlessness, vomiting, diarrhea, headache, dim vision, stupor or apathy, suppressed or scanty urine, sometimes convulsions and, rarely, death. Usually, even in this severe state, recovery follows, though the urine may be suppressed for a day or more. Retention may occur, and

this lead to faulty diagnosis of suppression; physical examination may settle the difficulty, and catheterization may be necessary.

**Treatment.** Prophylaxis is important. The acute infectious diseases should be avoided for the sake of the kidneys, if for no other reason. Scarlet fever is perhaps the most dangerous of these, so far as the renal effects are concerned.

All lesions must be corrected, and the lower thoracic region kept free from all tension.

During the progress of any infection, the condition of the lower thoracic spine should be watched, and any tension of the tissues, or any bony lesion, should receive immediate attention. Since the toxins are the real cause of the renal injury, a part of the treatment of the acute infections should be the elimination of these toxins by the bowels and, to some extent, the skin. Abundant water supply is important; the diluted urine is much less irritating to the renal epithelium. Plentiful water is also necessary to the activity of the liver, bowels, skin, and lungs; also, a normal amount of water maintains the normal blood pressure and facilitates the normal action of the heart. Only when edema appears, is some restriction of the water intake indicated.

Frequent sponging, warm baths and enemas as needed, maintain the normal activity of skin and bowels.

In order to diminish the burden upon the kidneys, the diet should be completely salt-free, and should contain only a minimum of nitrogen. Milk enough to meet the protein requirements, or somewhat less, should be given, and the necessary calories provided in cereals or other carbohydrate food. Kumyss, whey, buttermilk or junket may be used instead of sweet milk, if this seems desirable. Meat and eggs are not permitted at all.

Rest in bed is always necessary, and chilling is to be avoided.

In cases characterized by suppression of the urine, with or without edema, more radical measures are indicated. The treatment of the lower thoracic region must be very thorough, and the treatments given once or twice each day. In these cases corrective work may be done vigorously, in such a manner as to stimulate the spinal centers.

The elimination of water and toxic substances by other means than the kidneys becomes urgently necessary. The bowels offer the most efficient service. Enemas may be given until the colon is well emptied, then the drip method or the two-way colon tube may be used for continuous washing. Water at 104 to 108° F. or normal salt solution at the same temperature with a trace of bicarbonate of soda, should be used for this irrigation. From one to six hours each day may be devoted to this colon irrigation, and the toxemia thus be considerably diminished.

The skin and lungs eliminate considerable amounts of water. The air of the room should be dry and warm, and fresh as is possible. Sweating should be abundant. Hot packs, hot baths, the vapor bath, flannel wrappings with hot water bottles, may be used to maintain sweating. The child should not be too greatly weakened by any of these measures. Salt rubs stimulate the skin, but should be carefully given.

Dry cups or mustard plasters over the lower thoracic region and the loins may be employed in the interval of treatment, in serious cases.

For patients who have been neglected until the condition is very serious, catharsis may be necessary. Enemas of normal salt solution, soap, molasses and milk, or solutions of Epsom or Rochelle salts, in emergencies, may be used. It is best not to give purgative drugs by mouth, as these tend to be absorbed, and thus add to the burden of the kidneys. There is danger of weakening the child by too strenuous catharsis.

Infusions of normal blood, about two cubic centimeters injected into the pectoral, gluteal or biceps muscle, often initiates increased renal activity.

If the uremic symptoms are very severe, with delirium, coma, diarrhea, vomiting, high fever, convulsions, with the odor of urine about the child, venesection is indicated. From one to six ounces of blood should be withdrawn from a vein. If the child is very weak, an equal amount, or double the amount, of sterile normal salt solution should be replaced in the vein, or injected into the peritoneal cavity.

During the acute stage of nephritis, only milk, fruit juice, and water should be given the child. The protein requirement for the child's age and weight should be scantily met by the use of milk. The calories required should be made up in carbohydrates, preferably cereals.

In very severe cases, no food at all should be given until renal functions show improvement.

With returning renal activity, fruit juices, vegetable juices, and increased amounts of milk may be given. Older children are not permitted eggs or meat of any kind, nor any meat broths.

Convalescence from any serious nephritis is slow. Relapses are frequent, and these may be very serious or even fatal. Complications include dropsy of the serous cavities, the peritoneum, pleural sacs, the pericardium, and sometimes the joint cavities.

Anemia usually follows nephritis of any severe type, and this must be combatted by dietetic measures and by the treatment given for secondary anemia.



A warm climate for a year or more is usually very beneficial, after an acute attack, or during the subacute renal disorders which often follow the acute stages.

**Prognosis.** In general, the outlook is favorable for recovery. Death may occur during the attack, from uremia or from dropsy, or a chronic nephritis may follow the acute attack, and this may be fatal, or recovery may follow a long illness.

#### CHRONIC DIFFUSE NEPHRITIS

This is a rare condition during childhood. Marked nutritional disturbances are constant; the term "renal dwarfism" has applied to the disease on that account. Both mental and physical development are greatly retarded. The children are pale and weakly and the skin is of a peculiar grayish or yellowish tint.

The urine shows the characteristics present in adult chronic nephritis. Albumin is almost constantly present, but is never high.

Cardio-vascular symptoms seem to follow the nephritis, not to cause it.

Treatment is that of acute nephritis.

The disease terminates in uremia and death.

At autopsy the kidneys are found small, pale and atrophic. The capsule is adherent. Scarring of the kidney surface is usually present. The cortex is diminished in thickness.

First hypertrophy, then atrophy of the glomeruli, degeneration of the tubules and increase in the connective tissue are the most constant findings. A congenital origin of the disease is suspected.

#### CHRONIC NEPHRITIS

(Interstitial Nephritis).

This is rare in childhood. Toward puberty it is somewhat more common, approaching the conditions of adults. Chronic inflammations may follow neglected or improperly treated cases of acute nephritis of any type, or the condition may be interstitial from the beginning.

Very rarely a form of chronic interstitial nephritis, with arteriosclerosis, high blood pressure, cardiac hypertrophy, and other symptoms such as are found in the adult, may be found in a child. These are usually but not always syphilitic.

More commonly there is normal or very slightly increased blood pressure, slight or no cardiac hypertrophy or dilatation, and only a long, slow, progressive weakness and anemia.

Treatment is that of acute nephritis.

Prognosis is very grave. Death is to be expected.

#### PYELITIS

(Nephritic Abscess; Suppurative Nephritis; Pyonephrosis; Pyelonephritis).

Bacterial invasion of the kidney is not rare in children. The immunity of the kidneys is diminished by the presence of any of the renal disorders just mentioned, and also as a result of lesions of the lower thoracic vertebrae.

During infancy the colon bacillus is the most common infectious agent. Mixed infection is fairly common. Streptococcus, staphylo-

eoëcus, gonococcus, bacillus of tuberculosis, bacillus pyocyaneus, typhoid bacillus and the bacillus of diphtheria may be present alone, or, more often, associated with the colon bacillus.

The manner in which bacteria reach the kidneys has been much disputed. That cystitis is often followed by pyelitis is unquestionable. The short urethra in girls has been considered responsible for the fact that girls suffer from pyelitis nearly four times as often as do boys. On the other hand, it would seem practically impossible for an ascending infection to occur in boys, and yet boys do suffer from cystitis and pyelitis.

Animal experiments seem to indicate that ascending infection is much facilitated by disturbance of the circulation through the kidneys, ureters and bladder.

Infections are undoubtedly blood borne in many cases. The carriage of infectious agents, especially the colon bacilli, by way of the lymph channels seems anatomically very easy, especially to the right kidney, the most often affected. The fact that the lymph flows downward toward the kidney does not present greater difficulty than does the fact that urine flows downward make ascending infections impossible. Blood cultures show the presence of colon bacilli; and sometimes pyelitis follows such positive tests in adults. Hematogenous infections should be found about equally in the sexes, whereas nearly three-fourths of the cases of pyelitis are found in girls.

The manner of infection must, so far, be left unsettled.

### Types

**Primary pyelitis** is rather common in babies and little children. It often occurs during attacks of diarrhea without being suspected. No inflammation of the ureters, bladder or urethra is present in these cases.

**Secondary pyelitis** is uncommon, and is associated with disease of other areas of the urinary tract. Renal calculus, neoplasms, deformities, tuberculosis or perinephritis inflammations may be etiological factors. Any acute infectious disease may cause pyelitis.

**Pyelocystitis** is an associated inflammation of the bladder and the renal pelvis.

**Pyelonephritis** is an associated inflammation of the pelvis and the cortex of the kidney.

**Pyonephrosis** is a pyelitis in which a considerable amount of pus accumulates in the pelvis of the kidney.

**Renal abscesses** are usually multiple, and the infection is probably always carried by the blood. The glomerulus is usually the seat of the initial invasion. One or both kidneys may be affected.

**Hydronephrosis**, or dilatation of the pelvis and the upper part of the ureter, is a rather rare sequela.

### Diagnosis

**The symptoms** are usually characteristic. The temperature rises rather suddenly to 104° F. or more. Irregular chills are common. A dull pain in the loin seems to radiate into the abdomen. Micturition is frequent, and only a small amount of urine is voided at each time. The child grows weak rapidly, and has the usual symptoms of fever.

Within a day or more, vomiting, constipation or diarrhea, anemia, emaciation, weakness, and other symptoms of digestive disease may lead to incorrect diagnosis.

In some cases there is little or no fever and only the finding of pus in the urine suggests the correct diagnosis.

The course of the disease is not rapid, but there is great tendency to sudden exacerbations, and, when recovery seems complete, to recurrences. Recovery is the rule in children more than two years old, but babies are very apt to die.

Rarely the symptoms are severe from the start, and the child may die within a few days after the onset.

**Urine.** The total amount may not be affected. Albumin may be absent, and is rarely high. Pus cells, tubular epithelium and epithelium from the renal pelvis and from the bladder are found. Leukocytes are abundant; erythrocytes may be few or many. Hyaline casts are usually present. When any great number of epithelial and granular casts are present, pyelonephritis is indicated.

In multiple abscesses, the pus cells may not be very abundant. In pyelitis they are usually plentiful. Bacteria are present in varying numbers in the catheterized specimen.

**The blood** shows the characteristics of pyogenic infection anywhere in the body. Leukocytosis usually reaches 15,000, but may be 40,000 or more. The polymorphonuclear neutrophils are greatly increased; it must be remembered that these are much lower in the blood of normal children than in the blood of adults.

**Atypical cases** are common. Pneumonia, bronchitis, tonsillitis, appendicitis, gastritis, enteritis, colitis and other diseases have often been confused with pyelitis.

In severe cases a sharp, sudden, high fever, with diarrhea and vomiting usually lead to incorrect diagnosis. Nervous symptoms are marked in these cases, and convulsions are frequent. Prostration is severe, and anemia develops rapidly. Granular casts are present in the urine, in addition to the pus. These cases are usually fatal, though the child may live, apparently almost ready to die, for

several weeks. At autopsy it is found that the kidneys are seriously diseased; the cases are properly pyelonephritis rather than pyelitis.

### Treatment

If the colon bacillus alone is the infectious agent, or if there are multiple abscesses, surgery has no place in the treatment. If it is possible to catheterize the ureters, and if one ureter produces fairly normal urine, positively non-purulent, while the other produces purulent urine, containing other infectious agents than the colon bacillus, then the injured kidney should be removed lest the other kidney be affected, or pyemia develop.

In non-operative cases, and this includes those in which both kidneys are infected, and those in which the colon bacillus is the only infectious agent present, other methods are indicated.

Corrective work in the lower thoracic region should be persistently but gently given.

Abundant water should be given, with fruit and vegetable juices and enough milk to provide for a rather low proteid requirement. Drugs to diminish the acidity of the urine are not required when fruit and vegetable juices, diluted, are freely given.

Urotropin (hexamethylenamin) has been much praised, but later medical articles deny its value. Its use was based upon the fact that in an acid medium it forms formalin, an antiseptic. This has no useful effect so far as destroying the bacteria in the kidneys is concerned, and it should never be used.

Infusions of normal blood, one or two cubic centimeters, injected into the pectoral, gluteal or biceps muscle, often increases the child's ability to resist this infection, as it does for other infections in the body. Typing is not necessary for these infusions.

### Prognosis

When the colon bacillus is the only infectious agent, the prognosis is good for recovery. Relapses may occur within the next four months, but are not apt to occur after that time.

Children who suffer from the mild, chronic form, in which the presence of pus in the urine is about the only symptom, may continue in this condition for years. There is always danger of sudden severe nephritis, but this may never occur.

The sudden and malignant cases are usually fatal. Operative cases, always remembering the necessity for one normal kidney, usually recover completely.

Gonorrheal and tubercular cases are either fatal, or terminate in a chronic condition which ultimately becomes fatal.



**PERINEPHRITIS**

(Perinephric Abscess).

Fortunately this is one of the least common diseases. An inflammation of the fatty tissue or the connective tissue around the kidney may terminate in resolution and absorption, or in suppuration. This disease is often confused with tuberculosis of the spinal column or the hip joint.

**Etiology.** Trauma is the most common cause. In many cases no cause can be found. It may be secondary to pyonephritis, disease of the suprarenals, or purulent processes in the ureter, as in calculus. Any of the pyogenic bacteria may be found in the pus, or the pus may seem to be sterile.

**Diagnosis.** The symptoms vary. In acute cases there is an onset with chills, high fever, to 103° F. or more, and various digestive disturbances. Pain in the lumbar region may be dull or very severe, and may radiate or be referred to the hip, spinal column, groin, knee or lower abdomen. Any movement of the back or of the leg on the affected side increases the pain. In walking the child bends to the affected side, in an effort to protect the painful areas. As the inflammation increases walking becomes impossible, and finally the child is forced to lie quietly with the thigh on the affected side flexed upon the abdomen.

The fever is remittent and irregular, with occasional chills.

In subacute cases the onset is less severe, with lower temperature, less pain, increasing slowly, and more gradual development.

The abscess may form rapidly, in acute cases, the pus find an exit, and recovery be fairly complete within a few weeks. The subacute and chronic cases may persist for years, if the pus finds an exit, and the child suffer severely very rarely or not at all.

In some cases the fever, lameness and pain may persist several weeks before the swelling is noticed.

The urine shows only the changes present in suppuration anywhere in the body.

The blood shows neutrophilic leukocytosis, as in suppuration anywhere in the body.

Diagnosis may be difficult, especially in the subacute and chronic cases. Physical examination shows tenderness over the affected area, and, after the pus has accumulated, a swelling which is dull on percussion. An indefinitely outlined tumor may be found when the abscess is large, and this may give fluctuation. The skin over the abscess may be reddened and edematous. Passive movements of the thigh are less painful than active movements; all give much pain.

Tuberculosis of the hip joint may be suspected. This is characterized by tenderness over the hip joint, a very slow development, and the movement of the thigh in any direction is extremely painful. Movement of the thigh, when a perinephritis abscess is present, is painful on extension, but other movements of the thigh are painless.

Tuberculosis of the spinal column may be confused with perinephritis abscess. In caries of the spine tenderness is found around the spinous process of the affected vertebrae; and the typical angular deformity is usually found.

After the swelling becomes prominent, the diagnosis is easy.

**Treatment.** The child should be kept in bed, in the most comfortable position. Hot applications may give relief and prevent the formation of pus, if applied in the early stages. When the accumulation of pus is recognized, the abscess should be opened and drained.

The child should be kept upon a diet of milk, cereals and fruit and vegetable juices, with abundant water intake. Meats, eggs and other proteid foods, other than milk, are to be omitted completely.

## CHAPTER LIV

### FUNCTIONAL DISEASES OF THE GENITO-URINARY SYSTEM

By functional diseases of these organs is meant the diseases which are not associated with recognizable tissue changes in the organs affected. Properly speaking, this should include the lordotic, cyclic, and orthostatic albuminurias, but these conditions are associated in discussion with the nephritides, since they are so intimately related to them.

**Functional suppression** (Neurotic suppression). The secretion of urine is sometimes delayed on account of nervous shock. Any severe emotional storm may cause a few hours retention. Almost any operation upon the bladder or urethra may cause such shock. No treatment is required other than rest.

**Diabetes Insipidus** is often included among the kidney diseases. Since it is usually due to disease of the pituitary gland, it is included with the Diseases of the Ductless Glands.

**Simple polyuria** may be either dietetic or nervous in origin. Neurotic children often void large quantities of urine after or during excitement of any kind. (Shocks are more apt to cause suppression than polyuria.) The milder and longer emotional excitements often cause polyuria; sometimes the amount of urine is doubled for a day. Usually nervous polyuria disappears within a few hours.

**Treatment** includes correction of the spinal tension which is always present, most marked in the lower thoracic region, and the correction of any lesions which may be found, in order to prevent further attacks. The water intake should be kept at the normal level. Food should consist of milk, fruit and vegetables.

### THE BLADDER

The bladder is subject to several nervous affections. It must be remembered that the bladder is controlled from two groups of spinal centers, one located in the first one or two lumbar segments and the other in the first two or three sacral segments. Anything which interferes with the activity of these spinal segments, or which affects the nerves to and from these spinal segments, must therefore affect the centers controlling the bladder. Vertebral lesions of the dorso-lumbar, the upper lumbar, and the lumbo-sacral regions affect the centers through the corresponding sensory nerves, and also affect the nerves directly by the edema of the tissues neighboring the lesions.

## VESICAL IRRITABILITY

(Spasm of the bladder).

**Etiology.** The most common predisposing cause is an irritable nervous system. Any nervous shock, sudden chilling of the skin, the irritation of concentrated urine as in fevers, strain of the lumbar spinal column or excessive fatigue may cause an attack in children predisposed to spasm of bladder. Vesical calculus or calculus in the urethra or the ureters may cause spasm without any predisposing neurosis.

Reflex causes include disease of any organ innervated from the upper lumbar or the upper sacral spinal centers. Renal calculus, diseases of the rectum, vulva, urethra, appendix, hip joint, and neighboring tissues may cause the spasm in children already susceptible.

Spasmophilia is not usually a predisposing factor, though children with spasmophilia are occasionally affected.

Spasm of the sphincter is rather rare. It causes pain and straining during micturition. The urine may contain excessive amounts of epithelium from the bladder, some blood, and occasionally considerable amounts of mucus.

Spasm of the detrusor mechanism causes frequent micturition. In severe cases only a drop or two of urine may be passed at a time, and the pain and straining may resemble that caused by spasm of the sphincter. The urine rarely contains any blood, mucus or excess of bladder cells when the detrusor apparatus is the seat of the spasm.

**Treatment** of vesical spasm includes relief of the tension of the lumbar tissues which is always present, increase in the flexibility of the spinal column, especially of the lumbar region, and correction of such other etiological factors as may be found on examination.

Hot compresses over the lower abdomen and the sacrum often relieve the attack. Very warm hip baths or tub baths may give even more speedy relief.

The drinking of abundant water diminishes the irritability of the urine, and thus tends to diminish the severity and the frequency of the attacks.

The diet should be such as to render the urine non-irritating. Abundant fruits and vegetables, with milk enough to meet the protein requirements, provide proper nutrition. Eggs may be permitted in moderation, but meat, meat broths, fried foods, rich desserts and candy must be prohibited. No child should be given tea or soffee, and these are especially harmful to children with nervous disturbances of any kind or with any disorder of the urinary tract.



The reflex causes, such as calculus, rectal or urethral lesions, or diseases of the hip-joint or appendix, should receive such attention as is indicated by the conditions found on examination.

### ENURESIS AND INCONTINENCE

**Incontinence** of urine is a condition in which micturition cannot be controlled. The term is usually applied to those cases with some structural basis.

Incontinence may be due to any one or more of several factors. Paralysis of the bladder may result from spinal or cerebral disease, or from coma or prostration from very severe attacks of febrile diseases, or other diseases characterized by stupor or coma. In all these cases the bladder becomes overdistended and the urine begins to dribble. Occasionally the bladder becomes full and then empties itself as in infancy; this is especially the case in cerebral diseases. Cystitis is often associated with incontinence.

Malformation may prevent the accumulation of urine, as in extrophy of the bladder, absence of the sphincter vesicae, and aberrant terminations of the ureters. Persistent urachus permits the urine to flow from the umbilicus.

Many idiots and some imbeciles suffer from incontinence during life. Congenital weakness of the muscles seems more often the cause of the incontinence than the mental state itself.

**Treatment** of incontinence is the treatment of the cause. After the correction of the primary disease or deformity, the control of micturition must be secured by education and the development of normal habits, as in the treatment of enuresis.

**Enuresis**, in the common sense of the word, is a neurosis. An unstable nervous system is almost invariably a strong predisposing factor. It is characterized by the persistence of the infantile habit of micturition, or by the loss of bladder control once fairly well developed. The former is by far the most common state.

The age at which bladder control is established varies according to the education of the child, its heredity, its freedom from neuroses or from disease, and other factors. Every healthy child should be able to control the bladder during day and night, except under unusual conditions. Great fatigue, emotional storms, fright, excessive laughter, indigestion, or exposure to cold may cause bed-wetting or involuntary micturition during the day in children several years old. Indeed, even adults apparently normal may void urine involuntarily if severe fright, or other emotional shock, occur when the bladder is well filled.

Before the age of two years, the term enuresis cannot be employed, since micturition is not supposed to be under control until about that time. The development, physical and mental, of the

child must be considered in deciding whether or not enuresis or merely a normal infantile habit is present in a child who is unable to control the bladder.

Urination is a reflex act, subject to control by the brain, even during sleep, after the age of about two years. The spinal nerve centers are located in the first and second lumbar spinal segments, and in the upper sacral segments. Descending fibers in the spinal cord carry the impulses concerned in the cerebral control of the spinal centers. Anything which affects these centers, therefore, is at least a potential cause of disturbed activity of the bladder.

The most common and efficient cause of enuresis is a subluxation of the third lumbar vertebra, or of the second or the fourth.

Sensory disturbances which affect the micturition centers may arise from any abnormality within the area of distribution of the nerves from the upper lumbar and the upper sacral segments. The list of these conditions is long, and includes irritability of the rectum, as from inflammations, worms, hardened feces, or fissures; renal calculus, adherent clitoris or prepuce, vulvovaginitis, abnormally narrow meatus, phimosis, balanitis, and the irritations produced by improper clothing, which rubs and injures the skin of the genitals, the wearing of wet or soiled clothing, masturbation, and the elimination of excessively acid urine.

None of these factors is an efficient cause of enuresis, but they must be associated with an abnormally irritable nervous system, or with some local abnormality of the bladder or urethra. Any agent which causes nervous irritability must here be considered an important etiological factor in enuresis. Bad heredity and incorrect hygiene are very great causes of abnormal nervous irritability. Any exhausting attack of the infectious diseases, the constitutional diseases, malnutrition from any cause or the nervousness resulting from unhappy surroundings may exert detrimental effects upon the nervous system.

Other causes of reflex irritation which may be concerned in the etiology of enuresis are adenoids, enlarged tonsils, nasal defects, foreign bodies in the nose or the ear, hyperopia, astigmatism, spinal curvature, and the postural defects associated with unequal length of legs. The importance of these factors may be over-estimated.

**Diagnosis.** Nocturnal enuresis is the more common type. The child controls the bladder during the daytime fairly well. Involuntary micturition may occur occasionally during the daytime, but usually some cause can be found for the accident. The bladder fills during the night, then empties itself, as is the case during infancy. In mild cases bed-wetting occurs rarely; in more serious cases the accident may occur once or several times each night. The first sound sleep is the usual time for wetting; children vary as to time. Often the child dreams of arising and voiding in vessel or toilet. Rarely the child is awakened by the wet clothing.

In more serious cases, especially those of long standing, diurnal enuresis follows the nocturnal form, which persists. The child may void urine involuntarily, often unconsciously, many times during the day. In severe cases the clothing may be wet almost immediately after changing, and be wet constantly. The urine undergoes ammoniacal decomposition, and the clothing becomes of very foul odor. The clothing washed in alkaline solutions and improperly rinsed facilitates ammoniacal decomposition. The irritation due to the ammoniacal liquid in contact with the skin is one factor in perpetuating the enuresis.

In diurnal enuresis children desire to void urine very frequently. Micturition speedily follows the sense of its need, and the child may be unable to retire in time to prevent wetting the clothing. Fright, laughter, and emotional disturbance may cause wetting in children ordinarily able to control the bladder normally.

The general health is usually not affected. Sometimes the children are neurotic, and this is one cause of enuresis.

Physical examination determines the existence of any structural causes for incontinence. In disease of the central nervous system other symptoms are usually evident. Nocturnal enuresis which occurs at long intervals may be a symptom of epilepsy. In some cases the diagnosis of nocturnal epilepsy may be long delayed. If the child can be watched during the night, the attack can be recognized. In children epilepsy is usually productive of mental symptoms soon after the onset of the attacks.

Uranalysis gives normal findings when the urinary apparatus is normal. Cases of cystitis are easily recognized by a careful microscopic examination of freshly voided urine.

**Treatment** of enuresis and incontinence includes first, the removal of all etiological agents. The correction of lesions of the third lumbar vertebra and its neighbors is of prime importance. Very rarely no lesions can be found; in such cases treatment should be given to increase the flexibility of the upper lumbar spinal column, and, if indicated, the muscles of the loins and back should be relaxed.

If the child is weakly and if the muscles of the back and loins are flaccid and weak, suitable exercises should be outlined and the child encouraged to take them with interest.

All structural abnormalities should receive attention. The rectum which contains worms must be cleaned out by the methods suited to the condition. Adhesions of prepuce or clitoris should be broken up, and if necessary the child should be circumcised. Vulvovaginitis, cystitis, balanitis and any other inflammatory condition should be relieved as soon as possible. No operation should be performed as a treatment for enuresis unless there is an actual structural abnormality for which surgery is indicated.

The child with diurnal enuresis must not be sent to school, nor allowed to associate with other children unless supervision prevents the normal children from deriding and mocking the unfortunate child. Excitement must be carefully avoided. A change of surroundings may be helpful; this is not necessary in ordinary cases.

Punishments are usually very injurious, especially is this the case with the spankings so often administered to the wet child. The spanking adds to the irritation of the lumbar and sacral centers, and may cause enuresis in children who might otherwise develop normally.

Rewards are more successful. The attention of the child is centered upon the reward, and the psychic effect is good.

Hypnotism has occasionally resulted in relief, but this does not remove the cause, and has several contraindications. Earnest talking with the child just before bed-time often helps the child to control. Even if he is little more than two years old and is not supposed to understand what is said to him, the talking may be useful. Children really do understand a great deal more than adults usually believe, and the effect of wise talking is good.

After a child is almost or quite asleep, suggestions may be employed. An earnest command that he must not wet the bed, faintly heard by the child, helps him to control himself, even during sleep. The performance should be repeated each night, and during the day little talks about the necessity for overcoming the habit help to strengthen the child's determination. He should often assert his intention to form cleanly and normal habits.

The sleeping room should be cool and well ventilated. The bed should have the foot elevated, or a small cushion may be placed under the hips. This diminishes the pressure of a small amount of urine upon the urethral region, and thus diminishes the frequency with which the reflex mechanism of micturition is initiated.

A pillow high enough to keep the head level and the neck straight may be permitted, but the pillow should not be large enough to support the shoulders. The child must not be allowed to lie on the back; this can be prevented by fastening a spool or some similar object to the back in such a way that he is awakened by lying upon the back.

Several drugs have been recommended; electrical treatment of the bladder itself has been employed; massage of the bladder through the rectum, and cauterization of the meatus in girls and of the neck of the bladder in boys have also been advised. These methods are dangerous, very rarely successful, and they usually leave serious after effects.

The child may be put to sleep during the afternoon, to prevent fatigue. He should not be permitted to become weary late in the



afternoon or during the evening. Gentle play may be permitted, but no strenuous games after four o'clock in the afternoon.

Nutritious food and abundance of water should be given early during the day, but the last meal of the day should be very light. Little liquid should be allowed after four o'clock, barely enough to prevent unpleasant thirst. The child may be taught to sip water, thus thirst may be avoided with small amounts of water. The food should contain very little salt during childhood under any circumstances, and especially must the child with enuresis avoid salt.

In order to avoid highly acid urine, the diet should include many raw and cooked vegetables, and much fruit. Meats are best avoided altogether. Eggs, milk and the leguminous vegetables provide enough proteid food. Excess of sugar is to be avoided.

Cool bathing serves to strengthen the muscles of the viscera as well as of the skeleton. A douche of cool or cold water to the skin over spinal column before bed-time serves the same purpose. Chilling is to be avoided.

The child should be awakened just before the usual time for his bed-wetting. He must be completely awakened, and must empty the bladder while thoroughly awake. During the day he should be compelled to empty the bladder at regular intervals, at first hourly or half-hourly, then the time should be gradually lengthened until the bladder becomes able to hold the normal amount according to the age of the child. The better development of the bladder and its nervous connections during the day provides the basis for correct functioning at night.

Every voluntary voiding of urine tends to diminish the spontaneous activity of the reflex centers; every reflex voiding of the urine tends to perpetuate the functioning of the infantile mechanism. Every source of nervous irritation diminishes voluntary functions and thus perpetuates the reflex activity.

**Prognosis.** Nearly all cases recover normal control of the bladder. Enuresis following an acute disease disappears within a week or two. If the condition is due to a persistence of the infantile habits, and the child is under four years, normal control should be developed within a few weeks. The longer the enuresis has been present, the longer the time for the establishment of normal functions.

With no treatment, the child may outgrow the habit, that is, the normal cerebral control may become developed as it is in babies, except that a longer time is required. Sometimes the habit persists until the onset of puberty, at which time all cases recover except those in which marked abnormality of the bladder or of the central nervous system is present. Idiots and early epileptics may never develop normal control.

## MASTURBATION.

Very tiny babies may suffer some irritation of the genitals and develop the habit of playing with them. Occasionally a child rubs the thighs, or handles the genitals, or passes through some stormy muscular contractions which seem to rise to a climax and then pass away rather quickly. After such an occurrence, the child seems somewhat languid, or perhaps goes on playing as if nothing had happened. Many mothers fail to recognize the nature of such habits, and thus the source of the irritation may be unrecognized. In these infantile cases, there seems to be no pleasant sensation; the whole series of events is a reflex answer to some irritation, usually of the genitals. It is very unfortunate that masturbation has become associated with an idea of something sinful; in little children it is as innocent as breathing, though it is not, at any time, normal.

Older children may become aware of the voluptuous sensations caused by friction of the genitals, and develop an injurious habit. Sometimes the sensations are first discovered through curiosity, or as the result of scratching. In this case secretiveness is not present until scolding or punishment causes a sense of guilt to be associated with the habit. In other cases the habit is taught by older children, always secretly, and then secretiveness and furtiveness are associated with the habit from the very beginning.

Probably normal children, untaught, never develops an injurious habit of masturbation. Neurotic children may injure themselves. Marked cases of masturbation are probably always rather the symptoms of some nervous disorder than its cause.

Any abnormality of the genitals may initiate the custom of handling or scratching the genitals, or of securing some other methods of relieving the sense of irritation. Adherent clitoris, vulvovaginitis, erosions due to irritating urine or to improperly fitted clothing, parasites, or to reflex irritations, are common causes in girls. The wearing of outgrown underwear which rubs and binds the genitals is a common cause in both sexes. Adherent prepuce, phimosis, and the accumulation of smegma under the prepuce are common causes in boys.

The habit is recognized by the occurrence of characteristic behavior in babies and young children. When the child is secretive it may be that the habit remains unrecognized. In normal children it ceases completely when the cause is eliminated and no recognizable ill effects follow. Neurotic children are apt to persist in the habit, and this adds considerably to the neurosis.

A furtive and secretive manner may be due to masturbation, or it may be due merely to shyness, especially when scolding and punishments are of frequent occurrence.

**Treatment.** The child should be thoroughly examined, under anesthesia if necessary. Any causes of irritation should be carefully sought and thoroughly corrected. This is all that is needed in the case of babies and very young children.

Children old enough to enjoy the voluptuous sensations commonly require more urgent treatment. Much harm has been done by frightening children by telling them of all sorts of horrible after effects. The child may be frightened into cessation of the custom for a short time, but it is almost inevitable that temptation becomes too strong, and then, since the prophesied evils fail to appear, he loses faith in the words of his elders. It is much better to tell the truth, which is that the habit is harmful and weakening, and that it interferes with physical development, and with beauty. The boy wishes to be strong; the girl wishes to be pretty, charming and attractive. It is true that the habit of masturbation diminishes these things. With such teaching, the child is apt to retain faith in the parents, and is much more apt to co-operate in efforts to overcome the habit.

**Prognosis.** The more nearly normal is the child, the more quickly he ceases the habit. The neurotic child has a hard struggle, under the most favorable circumstances. The feeble-minded child and the moron probably persist, more and more secretively, for months or years,—perhaps until puberty, perhaps during life. Idiots and some imbeciles never attain normal control. They are rarely secretive, but yield to every impulse without regard to their surroundings. Children with any disease of the central nervous system may or may not develop the habit, but if they do, they are very persistent in it.

## CHAPTER LV

### INFLAMMATIONS OF THE GENITALS

Inflammations of the genital organs of children are not uncommon. They are practically never venereal diseases, though they may be due to the gonococcus. The infectious agent is carried from one child to another by the same pathways that are used for the transmission of any of the acute infectious diseases. Very rarely are sexual assaults responsible.

Generally speaking, these inflammations are due to irritants, as by unclean diapers, improperly washed diapers, extension of diseases from other parts of the body, and infectious agents.

The external genital organs are innervated by nerves derived from the lower lumbar and sacral spinal segments. Lesions of the twelfth thoracic and the lumbar vertebra affect the circulation through the ovaries, tubes, vagina, vulva, urethra, uterus, penis, scrotum and testes. Acute inflammations are not due to these lesions alone, but the lesions lower the resistance of such organs. When infection does occur, whether lesions are present or not, reflex muscular contractions are caused; the tissues of the back which are innervated from the same segments as the inflamed areas become edematous, and both the edema and the reflex muscular contractions are the cause of further disturbance of the areas originally invaded.

It is evident, then, that the treatment of any of these acute inflammatory conditions should include the correction of any spinal lesions as may be found on examination, and the relief of the muscular contractions and the edematous state of the tissues around the vertebral segments in closest central relations with the inflamed areas.

### BALANITIS

Balanitis, or inflammation of the glans, posthitis, or inflammation of the prepuce, or balano-posthitis, inflammation of both the prepuce and glans, are most often caused by the retention and decomposition of the smegma which is associated with phimosis. Rarely diphtheritis or trauma or a complicating urethritis may be responsible. The reddened, swollen, itching prepuce, dysuria, and purulent or semi-purulent secretions are typical. Cystitis and hydronephrosis may follow.

**Treatment** includes the removal of the cause. The prepuce should be retracted, if this is possible, and the accumulations removed from beneath it and around the glans. If retraction is impossible, a saturated solution of boric acid, a warm normal salt solution, or a weak solution of potassium permanganate (1:8000) may



be injected beneath the prepuce, and thus the accumulations washed out or disinfected. Any soothing ointment, as boracic acid ointment, zinc oxide, or sterile vaseline, may be worked under the prepuce. In very severe cases it may be necessary to slit the prepuce, in order to secure cleanliness. Circumcision should be performed after the acute inflammation has subsided, if the prepuce is too small, but it should not be performed during the acute stage.

### INFLAMMATION OF THE SCROTUM

Inflammation of the scrotum is not rare. The most common cause lies in the diapers,—either they are not changed with proper frequency, or they are not washed thoroughly, or they are washed with soap, alkaline or chlorine-containing powders and are not thoroughly rinsed. The presence of alkaline washing powders in the diapers is responsible for ammoniacal urine, and this is irritating to the skin. The scrotal skin is very delicate, so that irritants which might not affect the neighboring skin may cause severe inflammation in the scrotum. Eczema may affect the scrotum also, and occasionally erysipelas, perineal abscess, balanitis, or inflammations of other neighboring tissues may invade the scrotum.

Since the scrotal tissues are loose, edema is always marked. Pain is not always present, and is never severe in non-phlegmonous cases. With abscess formation, there may be high fever, leukocytosis, and other constitutional symptoms.

**Treatment** consists, first, in removing the cause, if this can be found. Diapers must be thoroughly washed and very thoroughly rinsed, and the wet or soiled diapers must be removed at once. Any smooth talcum or other non-medicated powder may be applied to the skin. Eczema and erysipelas require the attention usually given these disorders. If an abscess forms, the pus must be evacuated.

If the pain is severe, inhibition of the lower lumbar and the sacral centers may give relief. Any tension of the tissues of this region should be relieved, in order that recovery may be facilitated.

**Prognosis.** In simple cases recovery follows the removal of the irritating conditions very quickly. Septic cases recover after a longer time.

### ORCHITIS AND EPIDIDYMITIS

Acute orchitis is often associated with mumps, and less often with other infectious diseases. Trauma occasionally causes orchitis, in boys who engage in rough games or who suffer other accidental injuries. Any pyogenic organisms may be found, or there may be no infection. One or both testicles may be affected.

Gonorrheal infection more often causes epididymitis than orchitis.

The symptoms include redness of the scrotum with swelling of the testicle on the affected side. Pain is usually rather severe, and the testicles are very tender. Reflex contraction of the muscles of the lumbar region and the loins is usually marked, and is associated with edema of the neighboring tissues.

Treatment includes rest in bed during the acute stage, with the testicles supported in a position which is comfortable and which permits free drainage. Cool, wet dressings are usually most comfortable.

The relaxation of the contracted muscles and relief of the tension of the lumbar and sacral tissues facilitates recovery and diminishes the pain.

**Prognosis** is good for recovery within a few days. Orchitis due to mumps may be followed by atrophy of the testicle affected. If both testicles are affected sterility results.

## URETHRITIS

Urethritis is very rare in babies and never very common during childhood. Simple urethritis may be due to extension from balanitis or posthitis, to the irritation caused by urine too strongly acid, or containing crystals, or to trauma. Specific urethritis is caused by the gonococcus; it differs from the simple urethritis in its greater severity and in the presence of the gonococcus in the urine or in the secretions from the urethral orifice.

**Diagnosis.** The symptoms include painful micturition, reddening and edema of the urethral orifice and the appearance of a purulent or muco-purulent discharge from the urethra. This may be forced from the urethra by pressure upon the penis or around the urethral orifice or may be found in the urine. This discharge contains epithelial cells, pus, leukocytes and sometimes erythrocytes, and several types of bacteria, in the simple form. The gonorrheal discharge contains a greater amount of pus, and these cells contain the gonococcus, but no other bacteria, or, rarely, a few other bacteria.

**Treatment** consists in removal of the pus and in securing thorough cleanliness of the glans and prepuce in boys, and of the vulva in girls; and in rendering the urine non-irritating. This is accomplished by increasing the water-intake, by the giving of as much of the fruit juices and vegetable juices as is adapted to the age of the child, and keeping the proteid food to the lowest limit of the proteid requirements for the age of the child. A protecting aseptic dressing should be worn, in order to avoid infection of the eyes and the transmission of the disease to other children.

**Stricture** may result, in boys, from gonorrheal urethritis. Vulvovaginitis may be associated with urethritis, in girls. Conjunctivitis may result from the infection of the conjunctivae, and this may result in blindness, though much less rarely than in the conjunctivitis found in little babies.

### MASTITIS

Mastitis occurs in both sexes. In the newly born the secretion of milk with or without mastitis is not a rare condition. It disappears shortly, with no ill after effects, unless improper treatment has been employed.

Later, mastitis may result from injury; in babies it is about equal in the sexes, but the older the children the greater is the preponderance among girls. Infection may occur, and abscess follow. The breast may be destroyed, or may remain in fairly normal condition.

### HEMORRHAGES

Genital hemorrhages are not often truly inflammatory, yet they may be considered in this connection.

They may be caused by any of the hemorrhagic diseases, by asphyxia at birth, tumors of the vagina or uterus, from any of the serious forms of acute infections, by injury or by inflammations. Several such hemorrhages may occur, without there being precocious menstruation.

Precocious menstruation is rare; it is associated with other evidences of sexual precocity. It has been reported as beginning at the age of two days and continuing during life. Pregnancy has occurred at the ninth year. These children usually age rapidly and die young. Their mentality is usually that of the age, but occasionally they develop rapidly both physically and mentally.

Treatment of the ordinary genital hemorrhage requires no treatment other than that of the etiological condition. For precocious menstruation no treatment is indicated.

### VULVOVAGINITIS

This is a common disease during infancy and childhood. Girl babies may contract gonorrheal vaginitis at the time of birth, and after birth they are frequently infected. Catarrhal vaginitis is often associated with ill health from almost any cause. Traumatic factors are less common, but must be considered in certain cases. Vaginitis is sometimes associated with inflammation of the mucous membranes elsewhere, and is often present during the course of any of the acute exanthematous diseases. Several types of vulvitis, vaginitis and vulvovaginitis are recognized.

**Simple vulvitis** occasionally occurs. If the inflammatory condition is early recognized and appropriate treatment initiated promptly, the inflammation may not reach the vagina. The treatment is that of simple vulvovaginitis.

**Gonorrheal vulvitis** is rarely found without simultaneous invasion of the vagina. A case of gonorrheal vulvitis in a girl with imperforate hymen has been reported; the hymen was so completely intact that the vagina was not invaded. The treatment is that of gonorrheal vulvovaginitis.

**Diphtheritic vulvitis** may occur; the vagina may or may not be invaded. This may be the only diphtheritic lesion present. The treatment includes local cleansing and antiseptic washes, and the dietetic and hygienic treatment of vulvovaginitis.

**Herpetic vulvitis** (Ulcerative vulvitis) may accompany herpes of the thigh and neighboring cutaneous surfaces. There may be vesicles upon the inner surfaces of the vulva. Herpetic vulvitis may occur during measles or almost any of the acute infectious diseases, especially in girls not kept clean or who are poorly nourished. The ulcers may attain considerable size, several ulcers may coalesce, and they may terminate in gangrene. Cleanliness and the application of antiseptic dusting powders or ointments, with improved general health, give good results.

**Phlegmonous vulvitis** (abscess of the vulva) may result from trauma, the extension of infection from neighboring tissues, or erysipelas. The abscess must be opened if pus accumulates. Cold applications may be used.

**Gangrenous vulvitis** (Noma pudendi) is the same process as that occurring in the mouth and called noma, or cancrum oris; except that in this case it occurs in the vulva. Poorly nourished children, who live in unwholesome surroundings, are most often infected. After any one of the infectious diseases, especially measles, the disease may be found among such children. It may follow ulcerative vulvitis. It usually affects one of the labia majora.

A hard, rather dark colored spot is first noticed, with the skin shiny over the most swollen area. A dark spot is found, later, in about the center of this area; this is first bluish, then black. This breaks down, and a thickish material of evil odor is discharged. The gangrenous area extends, preceded by the edematous area, and the vulva, perineum and mons veneris may become involved. Fever, headache, and other constitutional symptoms may appear, or no symptoms, aside from the etiological disease, may be noted.

Treatment must be given early. The gangrenous area must be removed completely, and the remaining tissue thoroughly cauterized.

The child must be placed in pleasant and healthful surroundings, and must be given such treatments, diet and care as best build up the general strength.



Prognosis is very gloomy, even when the disease receives early and vigorous treatment. Nearly all children die, and those who survive have marked deformity of the vulva.

### SIMPLE CATARRHAL VULVOVAGINITIS

This is a nonspecific inflammation of the vagina and vulva. It is common after the second year, and occurs during infancy.

**Etiology.** Any of the acute infectious diseases, especially measles, may be followed by catarrhal vaginitis. Traumatic causes are less frequent; a fall upon some sharp object, attempted rape, and the insertion of foreign objects by older girls are rare causes. Pinworms and scabies may be responsible for a very obstinate vulvovaginitis.

**Diagnosis.** Constitutional symptoms are usually absent. The child may complain of itching, or may be noticed scratching the vulva. A whitish discharge may be the first symptom noticed. This becomes yellowish and, if the parts are not kept well cleaned, a foul odor develops. The skin of the thighs may be reddened and excoriated. Reflex muscular contractions and tension of the subcutaneous connective tissues are found over the lumbar spinal column and the sacrum.

On examination the mucous membrane is swollen, red, and dry. The secretion is usually scanty, though it may be profuse. The microscopical examination shows abundant bacteria, including many types. Blood cells, epithelium and pus are abundant.

**Treatment.** The child should be put to bed until the acute stage is over. Daily irrigations of warm normal salt solution, half-saturated boric acid solution or mild soda solutions, must be given. Several pints of this solution should be used with care. A female urethral speculum should be carefully inserted, through this a small male catheter, connected with the reservoir, should be passed to the vault of the vagina. The speculum may be then partly withdrawn, and the solution turned on. It is necessary that the exit be free, lest the pressure within the vagina be too high and the infected liquid pass into the uterus.

The child should be kept clean by frequent bathing. Excoriated areas should be protected by ointments or dressings.

The diet must be chiefly liquid, and abundant water be given. Fruit and vegetable juices and broths may be given freely.

Infants may continue their regular diet, but an increased amount of water should be given between feedings.

Any lesions which may be found should be corrected. There is always tension in the lumbar region, and this should be relieved.

**Prognosis.** Recovery is to be expected, but may be delayed. Rarely a few days, and often several weeks may pass before the discharge ceases.

**GONORRHEAL VULVOVAGINITIS**

This is now known to be a very common disease of girlhood. Its prevention offers one of the most serious of social problems. It occurs in epidemics in children's homes and children's hospitals and is transmitted from one child to another with most remarkable celerity. Routine examinations of all children admitted to some hospitals show that about ten percent of all sick girls are infected. Day nurseries, kindergartens and schools are efficient agencies for spreading the infection. In private practice, especially among people who are of cleanly habits, the disease is less common, but is still fairly often found.

The vaginal epithelium seems not to be resistant to the gonococcus in children. The labia in little girls do not protect the vaginal orifice well.

The gonococcus seems able to dwell upon the normal mucous membrane, to injure the membrane by its presence, and thus to gain access to the submucous tissues. No matter how healthy the child, if the gonococcus gains entrance to the vulva or vagina, inflammation seems inevitable.

The difference in the effects produced in girls and in adults has led to the supposition that there are two or more types of the gonococcus. The type found in the adult acts very injuriously upon the conjunctivae, and its presence anywhere in the body is usually associated with fever and other constitutional symptoms. The type found in the vaginitis of little girls almost never causes conjunctivitis, though every opportunity for transferring the infectious agent by means of the hands, from the vagina and vulva to the eyes is present.

On the other hand, children very often contract vulvovaginitis from an adult known to be gonorrhoeal. The reason for these variations must be left for further study.

**Prophylaxis.** The statements just made indicate the difficulty of efficient prophylaxis. It is undoubtedly impossible to subject every girl in school to repeated vaginal examinations, in order to exclude infected girls from school. Even that impossible procedure would not exclude the very early and most infectious cases. In children's hospitals, the disease seems to be transmitted with most remarkable speed. If a child with gonorrhoeal vulvovaginitis is in a ward, even though she has her own nurse and her own personal belongings in every respect, other children are sure to become infected. About the only way to prevent an epidemic is to place the child and her nurse in a different building, and to prevent any relations whatever between the nurse of the infected child and other nurses.

For schools, the use of the U-shaped toilet seat, with constant cleanliness and frequent disinfections of the toilet rooms, seems

most important. Children should be taught to wash the hands with soap whenever leaving the toilet rooms.

In the home where children must live with adults with gonorrhea, great care should be taken to prevent infection of the children. Children should not sleep with adults under any circumstances and especially when the adult is infected with any contagious disease. An infected child should never occupy a room with other children during the night. Infected persons, adults or children, should have individual belongings. A common means of transmission of the infection is by the common use of rectal and vaginal syringes. Each member of the family who uses these articles should have his own syringe, and this should never be used by others.

**Diagnosis.** In mild cases there are no symptoms other than a slight vaginal discharge. On examination of this, gonococci are found lying free and also within the pus cells, the leukocytes, and the epithelial cells from the vagina. Other bacteria are usually absent, but rarely a very few others may be found. If no bacteria at all can be found, the disease is almost certainly gonorrheal.

In more severe cases there may be marked constitutional symptoms, fever, pain in the back and legs, and much pain in the pelvis and genitals. This is less often found in little children. Micturition is painful and, usually, frequent.

The discharge is profuse, yellow or greenish, and it may be very irritating, so as to erode the skin of the vulva, thigh and surrounding tissues.

The vagina may be examined by the use of a small vaginal speculum for older girls or a urethral speculum for smaller girls. The walls of the vagina and the cervix of the uterus are then seen to be deeply inflamed, and a discharge can be seen emerging from the cervix in many cases. A granular appearance is noticed upon the congested and inflamed areas.

The discharge should be examined microscopically. It contains much pus, occasionally blood, and the gonococci are found within the pus cells, the leukocytes, and the cells from the vaginal epithelium.

The gonococcus is recognized by its presence within the pus cells, especially. Other gram-negative diplococci, biscuit-shaped, are found occasionally within the normal vagina, but these are not found within pus cells as a rule. In doubtful cases animal inoculation should give a definite diagnosis. The harmless diplococci remain harmless, while the gonococcus causes typical reaction in rabbits and other animals.

Girls of school age may suffer severely. The inflammation may extend to the cervix, uterus, Fallopian tubes, and peritoneum. Sterility is a common result of this type.

Complications are less common in children than in adults. The inguinal glands may enlarge or, less often, they may suppurate. Conjunctivitis is rare among small children, but about seven percent of children of school age develop it. Arthritis is multiple and involves the small joints more often than the large. Endocarditis and pericarditis, meningitis, proctitis, and septicemia are some of the sequelae occasionally found. Masturbation often results from the discomfort. Sexual precocity often follows. Gonorrheal cystitis and pyelonephritis are not rare.

**Treatment.** Any vaginal discharge should be treated as gonorrheal until several examinations have demonstrated the simple catarrhal nature of the inflammation. A perfectly sterile discharge should be considered gonorrheal.

The girl must be kept in bed until the acute stage has passed. Very mild cases need not be kept in bed all the time. A vulval pad of sterile material should be kept in place, for the protection of the patient as well as for the protection of others. This must be frequently changed, and the discarded pads should be burned immediately.

Twice each day the vagina should be irrigated with a solution of permanganate of potassium, 1:8000. The vagina should be opened with a urethral speculum, and a small male catheter inserted to the vault of the vagina. This speculum is connected with the reservoir filled with the permanganate solution, and the fluid thus reaches every part of the vagina. Several pints should be used at each irrigation. The liquid draining from the vagina should be received into a vessel containing carbolic acid or some other disinfectant. The vessel itself should be cleansed and sterilized with steam or flame after using.

Small tampons of gauze soaked in a weak solution of argyrol are sometimes left in the vagina between irrigations.

The installation of 1 to 3 percent protargol, or solutions of similar strength of other silver compounds has been advised. The irrigations must be continued until the pus has disappeared completely. Then a sterile, smooth glass rod may be used to rub the vagina gently, and smears made from the adherent material. This should be examined and if no gonococci are found the irrigations may be discontinued for a time. Smears from the vagina should then be examined at intervals of three days, a week, two weeks and a month. If no gonococci are found at any time during the two months or so, the patient may be considered cured.

There are invariably reflex muscular contractions and tension of the lumbar and sacral spinal areas. Treatment for the relief of these conditions facilitates recovery, renders complications less frequent and makes the patient more comfortable.



Vaccine treatment had many advocates for a time, but recent authorities have no praise for the method.

The fact that this is not a venereal or shameful disease must be earnestly taught to the parents of the child.

**Prognosis.** This disease is rarely serious in early life, but it is extremely annoying and very tedious. Recovery is to be expected in about two months, in the average case, but occasionally the condition clears up, with vigorous treatment, within two or three weeks. Complete recovery cannot be actually determined until several years have passed without relapse. In very serious cases, complications may be feared. When the infection reaches the tubes, sterility is probable.

## CHAPTER LVI

### GROSS STRUCTURAL ABNORMALITIES OF THE GENITO-URINARY ORGANS

The gross structural abnormalities of the genito-urinary organs include deformities, dilatations and neoplasms.

#### THE KIDNEYS

Malformation of the kidneys is very rare. A single kidney may be found at autopsy. No ill effects result, unless surgical extirpation of the single kidney should be performed. Fusion of the two kidneys may be found, and the condition is that of the single kidney. The fused kidney may be of horseshoe shape. Supernumerary ureters are occasionally found; the pelvis of the kidney is usually double in this case. Persistence of the embryonic lobular condition of the kidneys is often found at autopsy. No ill effects result.

**Congenital cystic kidney** is usually double, though often one kidney is more seriously involved. The cysts seem to result from occlusion, though it is not known by what means the occlusion is brought about. The entire kidney may seem to be composed of masses of cysts, usually not larger than a grape, often barely visible; or there may be a few or many large cysts. The large cysts may be first noted as abdominal tumors. If enough renal tissue remains normal to provide for the necessary elimination of wastes, there may be no recognizable evil effects. If the renal tissue is not present in sufficient amount to carry out the renal functions, or if the cysts increase in size at the expense of the renal parenchyma, death from uremia is inevitable.

Occasionally the single kidney is cystic. The surgical removal of this is speedily fatal. Often both kidneys are cystic, one the more seriously involved. Surgical removal of this more seriously diseased kidney leaves the other kidney bearing the heavier load; the condition usually terminates in the total disability of the remaining kidney, and death. In all renal surgery, the functional activity of the other kidney must be determined before one is operated or removed.

**Hydronephrosis**, or dilatation of the renal pelvis, may be either congenital or acquired. Congenital hydronephrosis may be so great as to interfere with delivery. It is usually associated with some deformity of the kidney itself. While there is undoubtedly an obstruction in both congenital and acquired cases, the nature and location of the obstruction is rarely found in congenital cases. In a certain type of double hydronephrosis in the male, the obstruction is known to consist of an increase in the size and number of the

folds of mucous membrane that lead from the verumontanum to the urethral wall. These folds not only diminish the lumen, but they may act as valves.

Acquired hydronephrosis results from an impacted calculus, stenosis of the ureter, extreme phimosis, or pressure upon the ureter by some tumor or other external factor. Often the nature of the obstruction cannot be found even at autopsy. Thomsen considers an abnormal innervation of the different areas of the ureter responsible.

Unilateral hydronephrosis usually causes no symptoms. The tumor may lead to examination and diagnosis. Aspiration of the tumor produces urine, which gives the diagnosis. Nephrectomy is the best treatment. Drainage of the cyst gives relief, but there is danger of pyonephrosis from this operation.

Double nephrosis is inoperable. Nephritis ultimately results, with death from uremia. Life and comfort may be prolonged by the treatment for nephritis.

**Movable kidney** is rare in childhood. Malformations are often associated with abnormal position of the kidney, and thus they are apt to be imperfectly fixed in position. Normal kidneys may be placed lower and nearer the central line of the body than is usual; they may be well fixed in position and produce no ill effects. If a ureter is bent by the malposition, or is subjected to pressure, renal colic may occur. The ectopic kidney may be found as a small tumor. When this is associated with the renal colic an incorrect diagnosis of intussusception, appendicitis, fecal accumulations or other intestinal disease may be made.

Later in childhood movable kidney may be found rather frequently. Tumors, ill-fitting corsets, digestive disturbances and trauma may be responsible for the condition. Symptoms may be absent or severe. Digestive disturbances of almost any kind, a dull dragging and pain in the abdomen and loins, or marked neurotic symptoms may be noted. The diagnosis rests upon finding a tumor resembling the kidney in size and form, and capable of being pushed into the position of a normal kidney. It is possible to find the lower border of the kidney, especially on the right side, in many normal children.

The treatment consists in replacing the kidney and arranging pads or bandages to hold it in place. The general health of the child should receive attention, and efforts made to increase his weight to a point rather above normal for his age and height. The supports may be needed for several months or a year or more, but are usually ultimately effective. It is very rare that surgical intervention is required during childhood.

Lesions of the lower thoracic and upper lumbar vertebrae must be corrected. Lesions responsible for malnutrition are common and must be corrected.

### THE BLADDER

Malformations of the bladder are rather more common than malformations of the kidneys. The bladder may be absent or double, with or without a double urethra. Congenital diverticula have been found; this condition may not be recognized until autopsy. Partial obstruction of the urethra may cause enormous dilatation of the bladder; it may contain a quart or more of fluid.

**Umbilical fistula** is rare. It depends upon persistent and patent urachus. It may be associated with stenosis of the urethra, in which case the urine is discharged from the umbilicus.

**Extrophy** of the bladder is more common in boys, and is rare. A defect in the anterior wall of the abdomen and of the bladder permits the posterior wall of the bladder to be visible. The orifices of the ureters can be seen. Associated defects of the pubic bone, the penis, the clitoris, and other neighboring tissues may be found. The vagina may be absent, or there may be a cloaca including the vagina and rectum. The neighboring surfaces are always excoriated by the urine. The posterior wall of the bladder is inflamed.

The treatment is surgical. If there is evidence of a sphincter a plastic operation may be performed to secure a fairly normal bladder and genitals. If this is impossible on account of the lack of a sphincter vesicae or because of the extent and nature of the deformity, the ureters may be sutured into the rectum. The rectum becomes accustomed to the pressure of urine, and the child lives comfortably.

**Prolapse** of the bladder occurs, rarely, in girls. Part, or all, of the bladder protrudes through the urethra, or through the vulva; usually this follows violent straining at stool, during micturition, or during a convulsive attack. Dysentery or cystitis may be responsible for the straining.

Treatment consists in reduction of the prolapse, with the application of a bandage or pads to prevent recurrence. Rarely the dilated urethra may require surgical repair.

### THE PENIS

Malformations of the genital organs of the male present many variations.

**Adherent prepuce** may be included in this connection, though it is not, usually, a malformation. The prepuce and the glans are usually very slightly adherent at birth. With proper care, the retraction of the prepuce and constant cleanliness, a normal condition



usually develops. If the adhesions remain they become stronger, smegma accumulates, and irritation and inflammation may follow. Priapism, balanitis, various nervous symptoms and a tendency to masturbation are common results.

**Phimosis** is a narrowing of the preputial orifice. Congenital cases occur. Acquired phimosis is due to inflammation or edema of the prepuce; it is usually temporary. Adhesions are often associated with phimosis. Redundant prepuce may or may not be associated with phimosis and adhesions.

Phimosis usually causes little or no difficulty in micturition, but the difficulty of cleansing the glans and the inner surface of the prepuce leads to balanitis or posthitis. The decomposing secretions cause marked irritation and predispose to masturbation. Many nervous symptoms have been attributed to phimosis; in some cases the relation seems undoubted.

Treatment depends upon the condition found on examination. The orifice may be stretched with dressing forceps. Incision may be required. When cutting is required circumcision is usually performed.

The redundant prepuce, loose enough to be readily retracted, does not call for circumcision. With continued growth of the parts, the relations may become perfectly normal.

**Paraphimosis** is due to the retraction of a tight prepuce, which cannot then be replaced. The glans becomes edematous, bluish or purplish in color, and if the condition is not corrected gangrene may develop. The child himself may retract the prepuce, or the mother or nurse may do so in bathing. The swelling of the glans prevents replacing of the prepuce.

Pain and dysuria may be severe.

The treatment includes cold application to reduce the swelling, steady pressure upon the glans, the application of oil or ointment for lubrication, and the gentle pulling of the prepuce downward. A grooved director, or any similar object, sterilized and oiled, may be slipped under the fold of the prepuce and used as a guide.

Occasionally these methods are not successful. The constricting ring must then be cut. If the prepuce is really too small, so the accident is liable to be repeated, circumcision is indicated.

**Strangulation** of the penis is similar to paraphimosis, but is caused by the pressure of a string tied around the penis, or a rubber band or a ring slipped over it; boys do this as an experiment. The treatment is the division of the constricting band.

**Rudimentary penis**, or micro-penis, may be associated with any one of the types of Infantilism (q.v.). Among normal babies, the penis may seem abnormally small on account of the fatty tissue

around it. In some cases the penis really is much smaller than it is in the average child, but the condition is temporary. At puberty the penis enlarges very rapidly and it usually becomes normal before manhood. The small penis may cause the boy to have a sense of inferiority, chiefly on account of the teasing of other boys. This error must be corrected; the matter should be explained to him, so that he may not think himself deficient in any way. No other treatment is indicated.

**Hypospadias** is a deformity in which the urethra opens upon the lower surface of the penis. A groove extends from this opening to the end of the penis. The penis is usually very small in these cases, and the testicles fail to descend into the scrotum. The general appearance may suggest the female organs, and an erroneous decision as to sex be made. Occasionally the urethra opens upon the perineum; the scrotum is then divided and the female appearance is very marked. Very rarely a similar condition is found in girls; the urethra opens within the vagina, just behind the hymen or higher upon the anterior wall.

**Epispadias** is a very rare deformity. The urethra opens upon the anterior surface of the penis, sometimes just in front of the glans. Sometimes there may be a fissure the entire length of the penis, and this condition is usually associated with extrophy of the bladder.

**Congenital atresia** of the urethra may be complete, in which case there is extrophy of the bladder or a persistent urachus, or it may be very slight. Narrow urethra is a milder type of deformity. Acquired atresia, or stricture, may be the result of gonorrheal or other infection, or of trauma. Urethral diverticulum may be a congenital condition, or it may be due to the pressure of the urine behind a stenosis, a calculus, or a foreign body in the urethra. Urethral fistula is due to trauma or congenital deformity.

## THE TESTES

**Cryptorchidism** (undescended testicle) is not an uncommon condition. The term "ectopia testis" is applied to those conditions in which the testicle is found in the perineum or some other abnormal position.

The testicles usually descend from their original position beneath the kidneys into the scrotum during the last month before birth. About 10 percent of all boy babies are born with undescended testicles. Nearly all of these descend during the first week or ten days of life. Rarely descent is postponed for months or years. They may never descend in mental defectives.

The testicle in the inguinal canal may be mistaken for hernia. At this stage of its pathway to the scrotum it is exposed to injury, and is often very painful. If only one side is affected, the life of

the boy is not modified in any way. In bilateral cryptorchidism sterility results inevitably, and there may be other imperfections of physical development.

The testicle fails to undergo normal development in an abnormal position, and often undergoes degeneration. Its removal is then indicated.

When the testicles fail to develop within the first ten years of life, they should be implanted into the scrotum, or, if this for any reason seems impossible or undesirable, into the abdominal cavity.

### HYDROCELE

Hydrocele may be either congenital or acquired. It consists of an accumulation of liquid around the testis or the spermatic cord.

Congenital hydrocele may not show any tumor at birth, although the structural conditions which permit the accumulation of the fluid are present at birth. The extension of serous membrane which is carried by the testis in its descent fails to undergo the normal closure; the tunica vaginalis remains in communication with the abdominal cavity, and thus serous fluid flows downward into the scrotum. An elongated tumor extends from the lower edge of the scrotum and along the spermatic cord. The tumor is somewhat translucent; is filled with liquid, and can be reduced by raising the scrotum and allowing the liquid to flow into the abdominal cavity; or, in cases where the opening is very small, by exerting steady but gentle pressure upon the tumor. When the canal is closed at its upper end, the tumor cannot be reduced. This is called Infantile Hydrocele.

Hydrocele of the cord is due to a normal closure of the canal at its lower end, but an opening exists above, and the cord shows a small tumor. This may resemble an undescended testicle, a hernia, or an enlarged lymph node. The finding of the testicle in its normal position eliminates that possibility; the hernial sac may be translucent if filled with gas, the hernia is reduced with a gurgling sound, and is usually reduced en masse. A closed hydrocele of the cord results from a tube closed at both ends. This is called Encysted Hydrocele of the cord. It is not reducible.

**Treatment** of hydrocele is simple, and usually effective. In a communicating hydrocele reduction of the tumor and the wearing of a truss usually causes a mild inflammatory reaction and consequent closure of the canal. Non-communicating hydrocele may sometimes disappear voluntarily. If the fluid increases, a single aspiration of the contents of the cyst is almost always successful. If the fluid accumulates after aspiration, or after several aspirations, the injection of some irritant, such as iodine or carbolic acid, may be necessary in order to secure an inflammatory reaction with closure of the cyst. The application of iodine to the skin over the cord is sometimes advised, but the tissues are very sensitive and

serious inflammations may result. No iodine or other irritant should ever be applied to the skin of the scrotum.

### FEMALE GENERATIVE ORGANS

The female generative organs are rather more often the seat of neoplasms than are the male.

Hydrocele of the canal of Nuck occasionally is found in girls. It is treated as is hydrocele of the cord in boys.

The breasts are subject to malformation in both sexes. The presence of milk has been mentioned in Diseases of the Newly Born.

Absence of the breasts is very rare; it usually is associated with other malformations. Supernumerary breasts are more common. There may be two breasts upon each side, or the extra glands may be in the axilla or almost anywhere in the body. Abnormal location of the breasts is rather common; they may be opposite the second ribs, or as low as the ninth ribs. Rarely one breast is higher than the other.

Atresia of the vulva is rare. It may be an epithelial union only, or there may be secure union of the labia, with strong connective tissue fibers. This may be complete, and cause retention of the urine. Imperforate hymen is not uncommon. The condition may not be recognized until the age of puberty, when the menstrual discharge is retained.

Slight malformations of the uterus are very common. Many of the various types of ante flexion and retro flexion are congenital, and cause grave disturbances during adult life. These are almost never recognized during childhood.

The uterus may be absent or rudimentary. Bicornate uterus or a single uterus with a partial or complete septum may be found. When one horn of such a uterus is incomplete, with an atresia or absence of its cervix, there may be retention of menstrual discharge. The diagnosis is difficult on account of the fact that the other horn may be discharging almost or quite normally. Uterine prolapse may be partial or complete at birth. It is usually associated with spina bifida or other marked deformity.

The ovaries often show malformations. One or both ovaries may be absent, or accessory ovaries may be found upon one or both sides. Ovarian hernia is not rare; the ovary descends through the inguinal ring or through the femoral ring. The pedicle of the ovary may be long or imperfectly attached, with resulting torsion and sometimes strangulation. This causes great pain in some cases, but no symptoms whatever in others. At puberty pelvic disorders may result.

### NEOPLASMS

The kidney is rather subject to tumor formation, and these are usually malignant. Sarcoma is by far the most common; adenosar-



oma the most common type. These tumors are composed of embryonal glandular tissue; they often contain remnants of other fetal tissues. They may grow from the cortex or the pelvis of the kidney. The tumors may reach enormous size, and metastases are found in nearly all the other abdominal organs and the lungs. Adhesions are usually very abundant.

**Hypernephroma** is a tumor which arises from the suprarenals. Often cells characteristic of the suprarenals are found within the kidney, and these aberrant cell masses often undergo malignant proliferation.

Usually the great size of the abdomen is the first indication of the presence of renal tumor. Occasionally hematuria arouses suspicion. On examination the tumor is found; it may be found in the loin before it is recognizable by abdominal palpation. The tumor is soft, and may give some fluctuation. Its surface is usually smooth but may be lobulated. The tumor does not move with the diaphragm during quiet or forced breathing, and it may be possible to determine that it is attached near the spine.

There may be some difficulty in making the diagnosis of malignant renal neoplasm. Any abdominal tumor in a child under five years old, with hematuria, should lead to suspicion of hypernephroma, or of sarcoma of the kidney or adrenal. It may be impossible to determine that the tumor is associated with the lumbar region or with the kidney.

Enlarged spleen may be differentiated from renal tumors with some difficulty. The spleen grows downward over the intestines, while the renal tumor lies beneath the intestines. Hence, tympany over the tumor favors renal tumor, while absence of tympany favors the enlarged spleen. The enlarged spleen is always smooth, while the renal tumor often presents a lobular surface. The blood usually shows abundant splenocytes when the spleen is enlarged.

Tumors of the liver are very rare during childhood. The renal tumor can usually be separated from the edge of the liver, by palpation, while the hepatic tumor, of course, cannot be so separated. Hematuria is not present in tumors of the liver, but is almost invariable, at some time, in renal tumors. Jaundice may or may not be present in hepatic neoplasms, but is not present in renal tumors.

Hydronephrosis, ovarian cysts or dermoid tumors, perinephritic abscess and tubercular abdominal lymph nodes may present difficulties in diagnosis. Leukocytosis is present when an abscess is found. Ovarian cysts and dermoids are very rare. Hydronephrosis is characterized by definite fluctuation. The presence of tubercular symptoms elsewhere in the body suggests the tubercular lymph nodes. Hematuria is not associated with lymphoid disease.

The treatment is surgical; the prognosis is very gloomy even under the most favorable conditions, but surgical removal of the tumor gives the only possible chance of continued existence.

**The bladder** is very rarely the seat of neoplasms during childhood. Sarcoma is the most common, and the mucous membrane between the urethral entrance and the ureters its most common location. The symptoms include pain above the pubis, sometimes absent, hematuria, and occasionally obstruction of the flow of urine. Cystoscopic examination may make the diagnosis clear, especially in girls. Rectal palpation may locate the tumor. Cystitis, hydronephrosis, peritonitis and nephritis are common complicating symptoms.

The treatment is surgical, and the prognosis gloomy at best.

**The ovaries** are rarely the seat of neoplasms. Dermoids are occasionally found. Cysts are more common than tumors of the ovary. If any symptoms result from the tumors, they should be removed.

**The testicles** are occasionally associated with dermoids, and very rarely with other tumors such as sarcoma and carcinoma.

**Vaginal polyps** are occasionally the cause of hemorrhages. They are usually easily removed, and the prognosis is good. Vaginal sarcomata are often of polypoid form and these are less easily removed; they invade neighboring tissue freely, and the prognosis is very unfavorable.

**The uterus** may be involved in malignant neoplasms. Sarcoma is more often found than carcinoma.

**The prostate** may be affected by sarcoma; less often by carcinoma, in children.

The treatment in all cases is surgical or palliative, and the prognosis is very gloomy in cases of sarcoma or carcinoma.

## **PART VIII. DISEASES OF THE BONES, JOINTS AND MUSCLES**

### **CHAPTER LVII**

#### **THE BONES**

The locomotor apparatus includes the bones, joints and muscles and the nerves which control them. The disorders of the motor nerves are described in a section devoted to the Diseases of the Nervous System.

**Congenital diseases** of the bones are not common, but are occasionally found; they cause marked deformities. After birth, several diseases are found rather commonly in which the bones are either primarily or secondarily affected. Traumatic causes of bone affections are not limited to any time of life. The bones themselves may be the seat of pathological changes; they may be changed in form, as in the congenital diseases, or they may be dislocated, subluxated or even more slightly displaced from their normal relations with neighboring bones or other tissues. In any case slight or marked effects may be produced in neighboring or distant organs, according to the location of the affected bones.

#### **LESIONS**

Subluxations of the vertebrae or of the ribs are known to cause serious disorders of the tissues innervated from the segments of the spinal cord which innervate also the lesioned bones and their articulations. When vertebral subluxations are produced suddenly, as in accidental subluxations, the neighboring tissues are seriously affected. The blood vessels become dilated, the tissues edematous, and the tissue juices show diminished alkalinity. The nerves passing through these edematous areas are affected by the pressure, due to the edema, and by the diminished alkalinity of the lymph which nourishes the nerves. The sympathetic ganglia near the lesioned vertebrae are also affected by the edema and the diminished alkalinity of the nutritive fluids, and the organs controlled by these ganglia are therefore adversely affected.

The articular surfaces of the lesioned vertebrae are, by the fact of the subluxation, disturbed in their relations to adjacent articular surfaces. The abnormal sensory impulses initiated by this strain act upon the related spinal segments in such a way as to interfere with their normal activity; the organs controlled by these segments thus fail to receive their proper stimulation.

Lesions of vertebrae and ribs, occurring in young children or babies, act adversely upon the tissues of the body as is the case

when similar lesions occur in adults or older children. The evil effects of such lesions are more serious in small children and babies, because the skeleton is undeveloped. The cartilaginous skeleton may be deformed on account of lesions caused in early childhood and with ossification the deformities become permanent.

Babies may be lesioned at birth, by unskilled obstetrical manipulations. After birth unskilled handling, especially the carelessness which allows the baby's head to wobble around, unsupported, causes lesions of the cervical vertebrae or the occiput. As the baby grows older and learns to sit alone, to stand alone, or to walk, lesions are easily caused by the falls the baby receives. Later, boys and girls romp, fight and fall frequently, and lesions may be caused by these accidents.

**Symptoms** referable to the bony lesions of childhood persist for a variable length of time. If the bones develop in such a way as to compensate for the lesion, the bones thus being of atypical form, the symptoms soon disappear. If there is no developmental compensation, the symptoms may persist for months or years. A most important factor in the pathogenesis of many diseases is the existence of such lesions. Immunity is lowered, and the infectious diseases are contracted by lesioned children with ease.

### TUMORS OF BONES

**Multiple exostoses** are occasionally found. There is history of heredity in some cases, but others are sporadic. The cause is unknown.

The tumors are most abundant on the shafts of the long bones near the epiphyses; they are most common near the knee, shoulder and wrist. The tumor is covered with cartilage in young children, and beneath this is a layer of compact bone, beneath this is cancellous tissue, and within this is a medullary cavity resembling that of the bone from which the exostosis arises, and usually the cavity of the tumor communicates with the cavity of the bone.

The exostoses are harmless unless their size exerts pressure upon nerves. They do not limit the motion of the neighboring joints as a rule; rarely they may cause some slight limitation of movement. They are differentiated from myositis ossificans by being attached to the bone; by failing to limit greatly the movement of any joint; by being free from muscle or tendon, and by the absence of any bony tumor within the muscles of the body.

Treatment is not often required. When there are pressure symptoms the offending tumor may be excised.

**Multiple Enchondromata** resemble multiple exostoses except that they are composed of cartilage. They are sometimes hereditary or familial, but in many cases no family history can be found. They



are commonly found upon the hands, fingers, or upon the feet and toes. All four extremities may be affected. These tumors tend to thin the neighboring bones and to undergo cystic degeneration.

**Malignant tumors** are rare. Sarcoma is the most common of these; it has been reported in tiny babies. This tumor is painful, grows rapidly and often invades the joints. Metastatic sarcoma and carcinoma are occasionally found during childhood.

**Chloroma** is a peculiar tumor, very malignant, which is sometimes found during childhood. It arises from the bone marrow, most commonly of the skull. The first symptoms refer to the site of the tumor, most commonly to the eye, ear, nose and throat. The sternum, spine, ribs and long bones are occasionally affected. Metastatic growths are usually abundant, and may be found anywhere in the body. The tumor is a peculiar, localized, leukemic process. The tumor cells may be hyaline, in which the blood shows lymphatic leukocytosis, or they may be granular, in which case the blood shows leukocytic or eosinophilic myelocytosis. In a few cases the blood shows no recognizable changes. In any case the erythrocytes and the hemoglobin diminish steadily, and the red cells may greatly resemble those found in pernicious anemia.

Constitutional symptoms resemble those of the leukemias. Fever is variable, and may reach a high degree, then disappear completely within a few hours. Weakness, emaciation and malaise are progressive. The spleen and other lymphoid tissues show great enlargement.

**Prognosis** is extremely gloomy. Nearly all patients with this tumor die within a month or two months. No treatment has been found of value.

## CHAPTER LVIII

### SPINAL CURVATURE

Several types of spinal curvature are recognized. These have, probably, about the same systemic causes, and they vary according to congenital peculiarities, pressure relations, or habitual positions.

Etiology. Diminished alkalinity of the blood and lymph is one cause of curvature. The intervertebral discs and the articular ligaments become edematous and lose their elasticity, becoming also more extensible. Muscles also become increasingly extensible and lose their tone. Any cause of malnutrition may be associated with diminished alkalinity of the blood, and thus spinal curvature becomes easily possible.

The swelling of the discs increases the length of the spinal column, slightly but perceptibly. This is seen when the X-ray plate of the abnormal spine is carefully examined. The lengthening of the spinal column is not associated with any lengthening of the body of the child or of the ligaments and muscles. The head of a child is heavy, and the pelvis is fairly rigid. The spinal column is thus confined within a space which it should occupy normally, while its length is increased. Hence curving is inevitable. Experimental evidence shows that this is the case, and the types of curve thus experimentally produced are identical with those found in children with spinal curvature.

Nearly all scolioses arise after some wasting disease or some period of malnutrition. The curve may not be noticed for some years afterward, but careful questioning nearly always elicits a history of some such serious disorder. By comparing the apparent age of the curvature with the time of the malnutrition, it is usually easy to trace the curvature to its ultimate cause.

Rickets, marasmus, poor health following any of the acute infectious diseases, chronic bronchitis, tuberculosis, scurvy and other disorders of malnutrition are common causes of spinal curvature, and this is usually scoliosis.

The weakness of the spinal tissues and the underlying diminished alkalinity, with the increased length of the spinal column, are usually associated with some mechanical cause of the abnormal structural condition.

School children may carry books upon one hip, habitually; the "little mother" may carry a baby sister or brother upon one hip rather constantly, and thus tend to curvature of her own back as well as to curvature of the baby's back. Mothers who work with the right hand, carrying the baby upon the left, may thus encourage curvature of the baby's spine, and injury to their own nutrition and strength.

Pillows too high, pillows too low, a sagging bed, persistent lying upon one side; seats which are too high or too low, especially during the long hours of school; the carrying of heavy weights; the tendency of a tall child to bend toward a shorter playmate and many other improper habits or positions encourage the development of curvature.

None of these conditions produces curvature in the child with normal metabolism.

Muscular paralysis of one leg, such as that due to poliomyelitis, inequality in the length of the legs; contraction of the thorax, such as that which follows empyema, and other less common serious structural defects may cause spinal curvature in children in whom no history of malnutrition can be found.

Pott's Disease is discussed with other tubercular affections.

### Types of Curvature

**Lordosis** is an exaggerated anterior curve. It affects the lumbar, dorso-lumbar and lower dorsal areas of the spinal column most commonly. Lordosis is a characteristic of cretinism. It is found occasionally after weakening diseases, and is then due to weakness of the spinal muscles. Swelling of the intervertebral discs is always one factor. Coxitis, dislocation of the hip, and increase in the weight of the abdomen are common causes of lordosis. Dilatation of the colon, ptosis of the abdominal organs and tumors of the abdominal viscera are common causes of abdominal distension. The term should not be applied to short, localized anterior positions of vertebrae.

**Kyphosis** is a posterior curve, most commonly found in the thoracic or lumbar regions. It is most common in early rickets, and is then usually in the lumbar spinal column. Dorsal kyphosis, usually affecting the lower cervical vertebrae also, is common in weakly, round-shouldered children. Spondylitis may produce an angular kyphosis, and this is usually, but not always, tubercular (q.v.).

**Scoliosis** is very common. Probably at least half the children in school show some degree of scoliosis. Almost any deformity of the spinal column, the thorax or the legs is associated with some degree of scoliosis. Congenital scoliosis is associated with deformities of the vertebrae or the ribs. Probably some cases of scoliosis supposed to be congenital are really due to birth injuries, left without proper treatment by a careless obstetrician.

Rickets, poliomyelitis and chronic bronchitis are common causes of scoliosis. Deformity of the chest due to empyema is not a common cause. Unequal length of the legs, left uncorrected, always causes scoliosis.

Early cases may not attract the attention of the mother. The scoliosis may be recognized with difficulty upon careful examination, in very early cases. As the curve increases marked deformity may be produced.

The curve may be situated in any part of the spinal column. Always there is some rotation of the bodies of the vertebrae in the affected region, and this causes asymmetry of the thorax, on account of the disturbance in the position of the ribs.

### Symptoms

**Visceral disturbances** caused by the abnormal spinal condition are usually referable to the spinal segments at the extremes of the curve. Viscera innervated from the segments at the central area of the curvature rarely are disturbed by the lesion. No doubt this is due to the fact that within the curving part of the spinal column the vertebral relations remain fairly normal, and no pathological changes are occurring. At the upper and the lower extremes of the curve, however, the normal vertebrae are improperly related to the vertebrae of the curve. There is a certain amount of inflammation at these areas, and the extent of the curve is increasing. Hence these areas are the location of the lesion, and the effects produced upon the nerves of this area are practically identical with the effects produced by traumatic lesion of the same areas.

**Pain.** Dull, persistent aching of the spinal areas nearest the upper and the lower extreme of the curve is common. Rarely the areas of the central part of the curve are painful. A sense of weakness is usually associated with the aching. In many cases no pain or weakness is present.

These children often seem to be in perfect health, but with careful examination and persistent questioning it is usually evident that the child is really weak, has little stamina, contracts colds and contagious diseases easily or shows nervous symptoms.

### Treatment

Prophylaxis is important. Weakly children and children who are poorly nourished for any reason must be protected from any abnormal pressure conditions. These children should be compelled to lie down for ten minutes or so several times each day, until the muscles have regained normal strength.

Osteopathic treatment gives excellent results in nearly all spinal curvatures. Corrective treatments should be given at intervals which permit the best development of the child's recuperative powers, and which are not so far apart that the corrections secured at one treatment disappear before the next treatment. Corrective treatments should be given with a fair degree of stimulating briskness, and they should be given in such a way as to neither diminish



the tone of the muscles nor to increase the flaccidity of the ligaments. Treatments must be continued until the curve is completely corrected. After that, weekly examinations are necessary for two years or more.

Corrective exercises are helpful. These should be determined by the location and extent of the curvature. Usually it is best to decide upon some temporary set of exercises, and then to watch the back of the child while he goes through the exercises outlined. In this way, and by varying the exercises occasionally, the progress of recovery can be determined and any unsatisfactory conditions speedily remedied. If one leg is shorter than the other, the sole of the shoe should be thickened until the hips are level.

Diet and fresh air are important. Oxidation is facilitated by abundant oxygen intake, and this increases the alkalinity of the blood. Carbohydrates are best kept at rather a low level, though some cereals are necessary. Green vegetables and fresh fruits are important. If the fresh fruits and vegetables cannot be secured, dried fruit, soaked well but not cooked; canned tomatoes and other vegetables, and potatoes, turnips and cabbage can be used in abundance. Oranges, lemons and grape fruit can be given in moderation, according to the age of the child.

Proteid requirements should be met by the use of milk and eggs. Sour milk, buttermilk or any of the bacterial preparations of buttermilk can be used. Custards and milk soups can be given freely, according to the age and the digestive idiosyncrasies of the child.

If the curve persists after careful and thorough treatment, with the co-operation of the mother or nurse in regard to diet and hygiene, more drastic measures may become necessary. Several orthopedic operations are employed, and the advice of the best orthopedic surgeon accessible should be secured and followed.

## CHAPTER LIX

### MALFORMATIONS OF BONES

#### THE HEAD

Malformations of the skull are common among defective and rickety children. The effects of tuberculosis, syphilis and brain tumor are elsewhere described.

**Oxycephaly** (Tower head; acrocephaly) is an abnormal form of the skull, characterized by its great height. An acrocephalic skull is somewhat pointed. The tower head may be high and dome-shaped. Exophthalmus, nystagmus and paralysis of the oculo-motor muscles is a common condition associated with oxycephaly. Deformities of other parts of the body are frequently present in oxycephalic children.

The mentality is usually deficient, but may seem normal.

**Microcephaly** (small skull) is due to aplasia of the brain. The skull is developed according to the requirement of the brain. These children are always defective mentally, and are usually idiots. (See Microcephaly).

**Macrocephaly** (large skull) is usually due to hydrocephalus, but hypertrophy of the brain may cause a mild degree of macrocephaly. Macrocephalics are not of higher mental possibilities than are normal children, and they are often mentally defective.

**Brachycephalic** skulls are broad. The width is greatest over the ears. This type may be associated with normal mentality.

**Dolichocephalic** skulls are long and narrow. Mentality may be normal, but idiosyncrasies are common among dolichocephalics.

**Mesocephalus** is the normal skull.

**Platicephalus** (chemocephalus) is a flat skull. Mild degrees of platicephaly are not incompatible with normal mentality.

**Plagiocephalus** is an asymmetry of the skull. It is probably due to premature closure of the frontoparietal fissure on one side only.

**Leptocephalus** is a tall skull, not pointed as in acrocephalus, but tall and long.

**Trigonocephalus** probably results from premature closure of the frontal suture, with compensatory deformity of the posterior part of the skull. The front part of the skull is broad, and the posterior part is large and full. The rounded corners of the triangle are in the center of forehead and over the ears.

**Scaphocephalus** (boat-shaped head) is characterized by a ridge rising from the parietal suture and diminishing in the mid-line of the frontal bone. It is usually due to hydrocephalus.

**Prognathia**, or excessive protrusion of the lower mandible, is a common deformity of the mentally defective.

**Facial asymmetry** is due to deformities of the face, usually due to asymmetrical development of the facial bones.

**The palatal bones** present several deformities, and these are properly included as stigmata of degeneracy. The palatal vault is normally moderately broad, large and high. In defective children the vault may have a Gothic, horseshoe, asymmetrical, domed, flat roofed or hip roofed form. The *torus palatinus* is a projecting ridge along the palatal suture. Several varieties are recognized, such as wedge, narrow, broad or prominent.

**Cleft palate** is not uncommon; it is included among the stigma of degeneracy by nearly all authors. Cleft palate is commonly associated with cleft lip (hare lip).

### THE THORAX

**Funnel chest** is a depression of the sternum. The costal cartilages and the ribs may also be depressed, forming the funnel-shaped deformity. Congenital cases are reported. Rickets is often causative. Anything which interferes with respiration, such as adenoids, very large tonsils or impediment to the breath road at any point may cause the deformity.

Treatment includes correction of the abnormal condition. The child should be made to inhale and to exhale against resistance. Spinal lesions and lesions of individual ribs must be corrected as quickly as can be.

Obstructions to respiration must be removed. The child may be taught to walk around the floor upon his hands and knees, and to engage in any exercises and games which develop the muscles of the anterior surface of the thorax.

Blowing bubbles, blowing horns and blowing up toy balloons increase the intrathoracic pressure and tend to correct the depression.

**Pigeon breast** (chicken breast; *pectus carinatum*; keel-shaped chest). In this condition the sternum is elevated and the costal cartilages sunken, leaving the sternum prominent. It is a common condition in rickets. Dorsal caries and the resulting kyphosis also may cause the deformity. Respiratory impediment, such as adenoids and other causes of interference with the pathway of the air into the lungs may also be responsible. Why such impediments cause depressed sternum in one child and chicken breast in another cannot yet be explained.

Correction of any vertebral or rib lesions is important in treatment. Forced and prolonged inspiration and expiration are useful

in strengthening the pectoral muscles. Trapezium exercises are also useful.

Any unhygienic customs which can be found should be corrected. The diet should be that advised in rickets.

**Winged scapulae** are not rare. Weakness of the muscles attached to the scapulae causes mild degrees of wing-like position. Scoliosis produces unilateral elevation of the scapula. Displacement of the latissimus dorsi, paralysis or marked weakness of the serratus magnus or the hypertrophy of the infraspinati in pseudohypertrophic muscular dystrophy cause the angle of the scapula to be tilted outward, which causes the winged appearance.

**Congenital elevation of the scapula** (Sprengel's Deformity) is rare. One scapula is placed rather too high, and is rotated with the lower angle toward the spinal column. Other deformities are usually present elsewhere in the body.

The child cannot raise the arm of the affected side above the level of the shoulder. The head is turned somewhat toward the affected side.

Treatment includes attempts to place the scapula in its normal position. The bony bridge, when present, must be removed. Massage of the surrounding tissues is helpful; it must be persistent. If the condition remains unchanged after some months of treatment, the advice of a competent orthopedic surgeon should be secured.

**Cleidocranial Dysostosis** is a rare deformity characterized by imperfect formation of the bones developed from membranes. The skull is globular and brachycephalic, the forehead protrudes, the face is small, the palate high, and dentition delayed. The fontanelles remain open a long time, often until puberty. The cause is not known. It usually shows a hereditary or a familial tendency.

The most important deformity is that of the clavicle; this is represented merely by a cord of connective tissue, sometimes with a small bony area at each end. This permits remarkable mobility of the shoulder joints. The child is able to bring the shoulders together in front of the chest, and to throw the shoulders back almost to the midline. These children are shorter than normal children, but are fairly strong and have normal mentality.

## THE LIMBS

Deformities of bones of the limbs occur. The cause of these deformities is not known, but probably disturbances of the uterine circulation or the maternal metabolism, occurring at the time of most active development of the tissues which make up the mesoderm of the limbs, is a cause. Hereditary deformities are fairly common, such as six fingers or toes, webbed fingers or toes, or unusual length relations of the fingers or the toes.



**Ectromelia** is the condition characterized by the absence of one limb.

**Hemimelia** is characterized by the absence of the distal part of one or more limbs. The forearm may be absent, and the hands attached to the lower end of the humerus. The entire hand may be absent.

**Phocomelia** occurs when the proximal joint is absent. The distal joint arises from the body. The humerus may be absent, and the upper end of the radius and ulna be attached to the scapula.

**Polydactylism** is the condition present when a child has six fingers, six toes or both. Supernumerary fingers or toes are composed of prolongations of tissue; they are never perfectly formed, as are the digits in polydactylism.

**Syndactylism** is the condition due to webbing of the tissues between the fingers or the toes. More complete fusion is not rare. The webbing is easily operable. The more complete fusion may or may not be operable.

**Hypertrophy** of a single finger may occur, after birth. All tissues usually share in the hypertrophic process, but in some cases the bones do not undergo hypertrophy. The only treatment is the removal of the large digit.

Intrauterine amputations occasionally occur, usually from the pressure of the cord, looped around the limb. Amniotic bands also may amputate a limb. The leg or the arm may be amputated at almost any level, or a hand or a foot may be cut off.

**Congenital hip dislocation** is probably always due to a birth accident, and not to malformation. Defect of the acetabulum may permit dislocation with slight trauma, and this deformity may be associated with other deformities in the body. The treatment is discussed with other diseases of the Newly Born.

**Club-foot** (talipes) is a common defect. It is often associated with spina bifida or other deformities. It is present at about one birth in one thousand. Congenital club-foot is probably due to abnormal intrauterine conditions. Acquired club-foot may be due to disease of the ankle, cerebral paralysis of the muscles or paralysis due to poliomyelitis. The acquired cases are much more numerous than the congenital. The type of the club-foot depends upon the nature of the defect or the injury.

**Talipes varus.** The foot is adducted and inverted; the child walks on the outer border of the foot.

**Talipes valgus.** The foot is adducted and everted; the child walks upon the inner border of the foot.

**Talipes equinus.** The heel is drawn upward and the child walks upon the toes, thus resembling somewhat the position of the foot of a horse.

**Talipes calcaneus.** The foot is drawn upward and the child walks upon the heel.

Combinations of these types are common. Equino-varus is the most common form in congenital cases.

If the deformity remains uncorrected, the bones become seriously deformed.

Treatment varies according to the conditions found on examination. Tense ligaments may require section. Manipulation alone corrects many such feet. Casts are occasionally required. The advice of an orthopedic surgeon is desirable.

**Pigeon toes.** Normal children usually learn to walk with the toes turned slightly inward; rarely the feet are kept parallel during the first two or three years of life. In either case the condition is a proper one.

If the infantile condition persists beyond the fourth year, it may arouse anxiety on the part of the parents. Efforts to teach the child to turn the toes outward may cause flat-foot or knock-knee. It usually is much better to permit the inward-turning to persist longer than children are apt to do if any child shows such tendency.

Careful examination may show a definite cause for abnormal persistence of the infantile habit. Lumbo-sacral lesions and lesions of the femur may cause pigeon toe upon one foot; rarely both feet are affected by these lesions. Sacro-iliac lesions are less common, but are occasionally found. Knock-knee is a cause also, and children with pigeon toe frequently become knock-kneed.

**Flat-foot** is a common deformity. It may be congenital or acquired. In this defect the arches of the feet are lower than normal or they may be flattened completely. The inner aspect of the ankle becomes more prominent than is normal. The child walks upon the inner aspect of the feet, and the feet are thereby everted. There is more than the usual area of the sole exposed upon the outer aspect of the foot. Flat-foot causes knock-knee, if indeed the two abnormalities do not appear at the same time.

Flat-foot may be congenital or acquired. It is caused by muscular weakness or paralysis due to poliomyelitis. Ill-fitting shoes are a common cause. Tight shoes, high heels, heels which have been worn unevenly, tight stockings, rough darns or patches in the soles of the stockings and rough soles in the shoes are all common causes of flat-foot. Children's feet may grow so rapidly that the shoes are too tight before they are worn out, especially when "best shoes" are kept for occasional wearing. Children who walk too early, especially those who do not creep, often suffer from flat-foot when they are very young. Children are sometimes taught to turn the toes outward when they have been walking a short time; these are apt to injure the arches and to become flat-footed.

One arch alone may be injured. This may follow the use of shoes which are more illfitting upon one foot than the other; this is not an uncommon condition. More commonly the single flat-foot is caused by local weakness, such as follows sacro-femoral, sacro-lumbar or sacro-iliac lesions.

Flat-foot is usually associated with knock-knee.

The diagnosis is made by the examination of the feet and the knees. Babies may present difficulty in diagnosis, on account of the pad of fat under the arch. Palpation usually settles the question. The sole presents upon the outer aspect of the foot in greater degree than in normal children.

Treatment is easy in acquired cases, not of too long standing. By manipulation the foot may be brought into normal condition. It is necessary to remove the tight, rough or ill-fitting shoes or stockings. High heels are forbidden. The baby which has walked too soon must be taught to creep. Children who stand or walk too much must be taught to sit. Any child with flat-foot must be taught to turn the toes in, or to keep the feet parallel. He should be induced to walk barefoot and to walk on tip-toe many times each day, for as long as he can do so comfortably.

In cases of long standing manipulation may not be successful. Specially fitted shoes sometimes correct the deformity. Orthopedic surgery may become necessary.

Complications and sequelae of flat-foot may be serious. The strain causes various lesions of the hip and pelvis, and sometimes of the lumbar vertebrae. Knock-knees may precede, accompany or follow flat-foot.

The fatigue which results from the strain may be an important factor in the etiology of functional nervous diseases.

**Knock-knee** (*Genu valgum*). The abnormal bending of the legs at the knee, so that the two knees approximate or touch one another, is a common deformity. It is often associated with flat-foot. The feet tend to turn outward in late cases. When the deformity is beginning there may be pigeon-toes. One or both legs may be affected. When both legs are affected one leg is apt to be more conspicuously deformed than the other. The deformity is made more apparent by the increased size of the inner condyles.

When children are learning to walk they often seem to be knock-kneed, but this condition is only temporary. Such children always turn the feet in, as in pigeon-toe. No treatment is indicated in these cases, and the legs develop normally.

The causes of knock-knee include all conditions associated with severe weakness of the muscles and ligaments, such as poliomyelitis, rickets or marasmus. Improper methods of carrying the child may

cause knock-knee, but this is rarely the sole etiological factor. Lesions of the pelvis and the sacrum are other factors which may weaken the muscles and ligaments and thus cause knock-knee.

Diagnosis rests upon the approximated knees. The child stands and walks with the knees together and the ankles separated widely. When one leg alone is affected, or is much more markedly affected than the other, the child limps. When both legs are affected almost equally, a peculiar waddling gait results.

Prophylaxis is easy. Rickety children are those who suffer from any condition which might weaken the muscles and the ligaments should be watched, and corrective measures taken at the first appearance of knock-knee, as of any other deformity.

Treatment of knock-knee is nearly always satisfactory. The lumbar and pelvic lesions should be corrected. The bones may be bent persistently and frequently by manipulations. The mother may be taught to do this, and she must carefully avoid causing any pain or discomfort. The more skillful manipulations of the osteopathic physician should be given two or three times each week. If for any reason it seems best for the mother or nurse not to give the manipulations the child should be brought for treatment each day until some beginning change in the bones is discovered.

The inner border of the soles of the shoes may be thickened. Stocking suspenders should be forbidden. The child may wear socks, or he may go without stockings. He should walk barefoot as much as is possible without danger of chilling. Walking on the tip-toes is an excellent method of strengthening the muscles. He may be taught to stand with the heels together, to try to walk bow-legged, to walk upon the outer sides of the feet, with the soles turned inward, to clap the soles together and to stand upon one leg. All these exercises can be made into a game, if it is difficult to secure the co-operation of the child. Older children may ride a bicycle or a horse.

If these measures should fail to secure return to normal structure, the advice of an orthopedic surgeon should be secured.

**Bow-legs** (*Genu varum*). All infants are bowlegged to some extent, but this condition normally disappears when the child begins to walk. Rickety children are often bow-legged. Diapers which are too large or which are improperly placed may cause bowlegs in children otherwise normal. Children who walk too early may become bow-legged, especially if they are weakened from any cause.

The legs become bowed outward by the weight of the body. The femur, tibia and fibula share in the curving. The knees may or may not be bent. The rickety child which is held constantly or chiefly upon one arm may show one knock-knee and one bow-leg. Other rickety children show bowing of the legs associated with anterior bending, due to a habit of sitting cross-legged.



Examination of all the bones of the body is indicated when the bow-legged child comes for treatment. The conditions which cause bow-legs usually cause other deformities. The examination should be made with the child prone, supine, sitting and standing.

Treatment is less satisfactory than is the case with knock-knee. As long as the bones are fairly soft they may be bent into normal position by persistent manipulation. The mother or nurse may rub and stretch and attempt gently to straighten the legs several times each day. If for any reason she may not attend to this, the child should be brought for treatment as often as is possible.

Osteopathic reports show the importance of pelvic and lumbar lesions in these cases, and the correction of such lesions is a very important factor in treatment.

Prophylaxis is important. Rickety children and those of little strength should be prevented from walking until the legs are quite strong. Normal children should not be allowed to walk until the legs have been made strong by creeping. Rickety children should be made to assume different positions, and especially they should not be allowed to sit or to lie for any considerable time or frequency with the legs crossed or with the soles turned inward.

**Coxa Vara.** This deformity depends upon an improper angle of the neck of the femur with the shaft. This angle is obtuse in the normal femur, but becomes a right angle or an acute angle when the bone is subjected to abnormal conditions. In late childhood or early adolescence the neck of the femur may become weakened as a result of poliomyelitis, epiphyseal disease of any kind, fracture of the neck of the femur with union at the improper angle or under any abnormal condition which is associated with weakness of the ligaments and the bones. Rarely the deformity is congenital.

Rickety children often suffer this deformity in early childhood. Juvenile or adolescent rickets causes the deformity only rarely. Epiphyseal separation from trauma or other cause may be responsible for the development of the improper angle.

The symptoms include pain in the affected hip, often reaching the knee or the back. The affected leg is shortened and the pelvis is tipped upward. The head of the trochanter lies above Nelaton's line. Abduction of the hip is limited and internal rotation of the hip is emphasized. The knees pass each other, in walking, with difficulty. A definite "seissor's gait" is thus produced. When both legs are affected the gait may be waddling, resembling that of double congenital hip dislocation. This condition may easily be confused with congenital hip dislocation.

An X-ray examination of the hip gives definite information as to the exact nature of the condition.

Treatment depends upon the condition as shown on examination. Children should not be permitted to walk much whenever there is any reason to suspect weakness of the ligaments and the bones, and when the angle of the shaft of the femur with its neck becomes less acute than normal, walking should be prohibited altogether until the weakness has passed away. After fracture of the neck of the femur or separation of the epiphysis, walking and standing are to be prohibited until union is completed.

When the bone is healed with the acute angle or the right angle, orthopedic surgery is the only logical treatment.

## CHAPTER LX

### DISEASES OF THE BONES

#### IMPERFECT OSTEOGENESIS

(Idiopathic Osteopsathyrosis; Fragilitas Osseum; Osteogenesis Imperfecta; Periosteal Aplasia; Lobstein's Disease.)

There is a recent tendency to view this disease as constitutional and probably due to a disturbance in some of the internal secretions with the bony changes as the most prominent symptom. Since the bony changes are almost the only symptoms, and since the etiology is, as yet, unknown, the disease is included with other diseases of bones.

**Etiology.** The cause and the pathogenesis are not yet known. The disease seems to be familial and hereditary in some cases, but sporadic cases are found almost as often as those in which there is a family history of similar cases. Hereditary syphilis has been considered responsible in some cases.

**Symptoms.** The disease seems to be a mesodermal defect. The diaphyses are flattened and curved. Intrauterine fractures may number a hundred or more, and these cause great deformity. After birth, fractures result from comparatively slight trauma or even the strain of moving the limbs under the clothing, or an attempt of the mother or nurse to lift the child by the arms. These fractures heal speedily with formation of great amounts of callus. The callus becomes ossified or calcified and this increases the deformity. No pain occurs as the result of the fractures or during the healing.

**Treatment** has, so far, been useless. No cases have been reported under osteopathic care.

**Prognosis.** The child usually dies within a few years after birth. Occasionally he may live until puberty, greatly deformed and crippled. Mentality is not affected. None of these children live beyond puberty.

#### ACHONDROPLASIA

(Fetal Rickets; Fetal Cretinism.)

This disease may be due to some disturbance of the internal secretions, and is discussed in that connection. It is usually familial or hereditary. It begins during intrauterine life, and is characterized by micromelia. The skull is large, as in hydrocephalus, the jaw prognathic, the trunk fairly normal in size, and the limbs very short (with premature closure of the epiphyses). The hands are typical. The fingers are of almost the same length, and the middle and ring finger tend to fall apart, forming the "trident hand".

These children may be stillborn, or may die soon after birth. Those who live are of slow development mentally and physically. Their shortness, broad body, waddling gait, slow but otherwise normal mentality and normal sex development makes them well adapted to their ancient occupation, that of "court fool".

Treatment and prophylaxis are useless. They may live their lives normally until death at a rather early old age.

### OSTEOMALACIA

(Mollities Ossium)

This disease presents great resemblance to the osteomalacia found in adult women. In adults the ovaries are undoubtedly responsible for the disease; during childhood both boys and girls are affected.

The abnormality is not usually perceived until the child begins to walk, though it may be suspected by an observant mother that the baby is weaker than normal.

The cause of the disease is unknown. The bone changes and the weakness resemble those of rickets. According to several authors the disease is simply a juvenile form of rickets.

The first symptoms are usually pain in the bones and weakness. Later the bones bend, and finally they may break. The most marked deformity is due to the bending. The spinal column is affected, and marked kyphosis may result from the weakness of muscles and bones.

**Treatment** is that of rickets,—abundant fresh fruits and vegetables, milk and cream; plenty of fresh air and sunshine, and protection of the limbs and spinal column in order to prevent as much of the deformity as is possible.

**Prognosis** is always gloomy. Death usually is due to some intercurrent disease. Rarely recovery follows a long illness. The deformities are permanent.

### ACUTE OSTEOMYELITIS

(Acute Epiphysitis; Acute Septic Diaphysitis; Acute Periostitis)

This is an infection of the bone marrow, usually affecting many bones, but sometimes limited to one. The ends of the long bones are most affected, especially the femur near the knee. Any other bone may be invaded.

**Etiology.** The most common infectious agent is the staphylococcus aureus, but any of the pyogenic organisms, including the pneumococcus, may be responsible. These infectious agents enter the bone marrow with the blood.

Children are more often affected than adults, and boys rather more often than girls. The greater frequency of injury among boys may account for this.



Debilitating diseases, trauma, and any local infectious focus may be of etiological importance.

**Tissue changes.** The infection first affects the bone near the epiphysis, and an abscess forms. The pus may invade the Haversian Canals and reach the periosteum; acute periostitis then follows. Or the pus may reach the bone marrow, when acute osteomyelitis develops. The pus may invade the epiphysis, producing acute infectious epiphysitis, and thence may reach the joint, causing acute septic arthritis.

As a result of the purulent inflammation, the bone undergoes necrosis, and this portion, a sequestrum, remains as a further source of irritation. Granulation and attempted healing by the periosteum and the healthy neighboring bone is sometimes prevented by continued infection of the newly grown bone. In other cases the sequestrum is digested and absorbed, the growing bone meets no serious infection and recovery follows slowly. The bone may not grow in length after the injury, and its marrow may have been destroyed by the inflammation.

The purulent focus is a source of further pyemia, and other organs may be affected in this way; pericarditis, endocarditis, pleurisy, multiple abscesses, and other purulent inflammations may follow the osteomyelitis. Death usually follows these metastatic purulent inflammations.

**Diagnosis.** Symptoms are characteristic. The onset is sudden, with chills, high fever, sometimes convulsions or delirium. There may or may not be localized pain in the affected bone, with swelling of the tissues and reddening of the skin over it. In severe cases tachycardia, prostration, diarrhea, sweating, coma and death follow very quickly, often within a few hours after the onset. Pericarditis is a common complication in these fatal cases.

In less severe cases the pain, swelling and redness involve the entire limb, and arthritic symptoms increase the pain. When the femur near the knee is first affected, the hip joint is frequently the seat of purulent arthritis.

The blood shows secondary anemia of varying degree. Leukocytosis may reach 50,000 or more. Of these cells, 90% to 95% are polymorphonuclear neutrophiles, and of these half or more may contain only one nucleus. If the nuclear average increases, the hemopoietic organs are not reacting properly to the infection and the condition is growing more serious. So long as the nuclear average remains at about 2., the blood-forming tissues are reacting well to the infection. With recovery, of course, the nuclear average returns to the normal 2.4. Among the leukocytes many myelocytes and myelocytoid forms may be found.

The radiographic plate shows the condition plainly in most cases.

Acute rheumatism may be suggested by the symptoms. The joints are only secondarily affected in osteomyelitis, while in rheumatism the bones are slightly painful or not at all. Scurvy and hemophilia may cause pain in the bones, but the blood count in these diseases shows no leukocytosis, and their constitutional symptoms are very different.

**Treatment** is surgical. The bone must be opened and drained. If the tissue destruction is very great the limb may require amputation. After the operation general treatment for the relaxation of tense and edematous tissues promotes recovery. The affected bones should not be manipulated.

Food should be withheld during the fever, except for fruit and vegetable juices. When the fever diminishes the diet should still be limited, until the inflammation of the bone has been relieved.

If the blood count shows inefficient reaction on the part of the hemopoietic cells, the infusion of one or two cubic centimeters of normal human blood into the pectoral or the biceps muscle may increase the patient's reaction.

**Prognosis** is very gloomy. Children with a severe attack of osteomyelitis die within four days or less. If drainage is speedily procured, recovery may take place, but usually with the bone shortened and with its future growth delayed.

Tubercular infection may follow, and the bone remain diseased and draining for many years.

### TOXIC PERIOSTITIS

(Bamberger-Marie Disease; Toxicogenic Osteoperiostitis Ossificans; Hypertrophic Pulmonary Osteoarthropathy)

This disease affects the fingers, toes and ends of the long bones symmetrically. There may be scoliosis or kyphosis. The joints are not affected.

**Etiology.** The most common cause is congenital heart lesion or valvular lesions of early childhood. Any chronic suppuration may cause the deformity. Tuberculosis or other pulmonary disease, severe dysentery, especially in prolonged or repeated attacks, congenital syphilis, and chronic or prolonged renal disease often are associated with the "clubbing" of the fingers and toes, and enlargement of the ends of the long bones.

**Tissue changes** are characteristic. The X-ray shows that there is periostitis and marked thickening of the periosteum, with little change in the bone itself. The tissues over the affected bone shows considerable hyperplasia, and usually the tissues are hardened as well. The ribs, sternum and pelvis are rarely affected.

No treatment is indicated, other than that required for the primary disease. With increased strength, after the primary disease has been brought under control, the deformity diminishes somewhat. The fingers show some "clubbing" throughout life, after serious cardiac disease, suppuration or other chronic diseases.

### ACUTE PERIOSTITIS

**Traumatic periostitis** is due to injury to the periosteum, usually by a blow. The shin bone is most frequently affected.

No suppuration occurs, but there is marked edema of the periosteum and the neighboring connective tissues and sometimes of the adjacent muscles. A plastic exudate is usually present, and there may be small hemorrhages. Swelling and pain or tenderness are the only symptoms. The condition may resemble the periostitis due to syphilis, but the syphilitic form is less painful or tender. History of the trauma can usually be elicited.

Treatment includes protection from injury, and the application of an icebag. The knee and hip should be examined in order to determine whether any subluxations have resulted from the same trauma which caused the periostitis, if the shin is the bone affected. In case other bones are affected, the corresponding joints should be examined. When the trauma has been very severe, it is best to have an X-ray examination in order to determine whether or not a partial fracture of the bone may be associated with the periostitis.

Recovery should be rapid and complete, with proper treatment.

**Infectious periostitis** is due to the presence of some pathogenic organism in the periosteum whose immunity has been lowered in some way. Traumatic periostitis may be followed by infection. Trauma so slight as to attract no attention may so lower the resistance that organisms in the blood may cause infectious periostitis. This disease may also be one of the purulent inflammations found in pyemia. The X-ray examination should show the location of any pus focus.

If pus is present, the abscess should be opened and drained. The other treatment is that of traumatic periostitis.

Recovery is more slow than in the traumatic form. Pyemia is much less apt to occur than in acute osteomyelitis.

## CHAPTER LXI

### DISEASES OF THE JOINTS

The joints are less frequently affected by primary diseases in children than in adults. The effects produced upon the joints by bony lesions are not marked, but may be of considerable importance. When the bony surfaces concerned in any joint become changed from their normal relations, there is necessarily produced an increased pressure in certain areas of the articular surface and decreased pressure in other areas. The areas subjected to increased pressure show thinning of the synovial membrane and sometimes the underlying bone is affected by the pressure. The synovial membrane of the areas subjected to diminished pressure tend to thicken, and this thickening may become so great as to interfere with the correction of the lesion. Unless the thickened membrane undergoes calcification, or the tissues become greatly hardened, continued treatment usually causes thinning of the thickened areas with thickening of the thinner areas; thus correction may be secured only by persistent treatment. When calcification or sclerosis of the new tissue occurs, correction of the lesion is probably impossible.

### SUBLUXATIONS

Subluxations of the radius at the elbow may occur when a stumbling child is caught quickly and sharply by the hand, to save a fall. A child may be holding to some object, which suddenly falls or is jerked away; this strain also may cause subluxation of the radius.

Pain in the arm, and the inability to pronate the hand are the only symptoms. The history of the accident can usually be elicited, but sometimes the injury has been due to such a comparatively slight strain that it has been forgotten.

Treatment. The supinated forearm should be held firmly, pressure placed upon the head of the radius, and the elbow strongly flexed. The head of the radius is thus returned to its normal articulation.

Recovery is immediate, and no further ill effects are to be expected.

Subluxations of the cervical region are frequently found in little children and in babies. The heavy head, supported by feeble muscles, is thrown from side to side, with resulting subluxation of the occiput, third or sixth vertebra most commonly. Other lesions are less often found. Children supposed to be cross and fretful without cause often suffer from the effects of such lesions. The ordinary methods of technique may be employed for these, and recovery is instantaneous.



Subluxation of the lumbo-sacral articulation is very common in older children. The sacro-iliac articulation is less frequently affected. Coccygeal lesions are common, usually as the result of sitting suddenly upon some hard object. All of these are easily corrected by the usual methods of technique, if they are not of too long standing. Recovery follows the corrections less quickly than in the case of the correction of cervical lesions, but is fairly prompt.

### REFLEX AND REFERRED JOINT PAINS

The articular surfaces of any joint are innervated from the same spinal segments which supply the motor and sensory nerves of the muscles which move that joint, which supply the vaso-motor nerves which control the circulation through and around that joint, and which supply also the sensory and vaso-motor nerves of the skin over the joint. This law has certain exceptions, but is a fairly accurate statement of the anatomical relations.

If a joint is inflamed, the muscles which move that joint are affected; if the muscles which move a joint are inflamed or injured in any way, the joint is affected. Pain referred to a joint by children may be due to some abnormal condition of the muscles which move the joint, or of the vertebra corresponding to the segment from which the nerves of the joint originate, or to painful stimuli originating in some other organ innervated from the same segments of the spinal cord.

Pain due to abnormal conditions of the hip may be referred to the knee, pain due to injury of the elbow may be referred to the wrist, and so on. In examining children who suffer from pain in any of the joints of the body, it is necessary to look for abnormalities in all the tissues innervated from the same spinal segments, or by the same nerve trunks, as the joint which seems to be abnormal.

### ACUTE ARTHRITIS

(Acute Purulent Synovitis; Acute Epiphysitis)

This disease is commonest among babies not more than one year old. It is characterized by fever, pain and swelling of certain of the joints of the body.

Etiology. The disease is always due to infection, and is usually due to pyemia. The most common infectious agents are the streptococcus and the gonococcus; the staphylococcus, pneumococcus and the bacilli of influenza may be present as primary or as secondary infections. The bacteria gain entrance into the newly born by way of the umbilicus, and into children of all ages by way of the skin, digestive tract, conjunctivae, or genitals.

Lesions of the splanchnic region diminish resistance to infection. Such lesions may be caused during birth or as the result of unskillful handling during early infancy.

Septic arthritis usually follows osteomyelitis, but may arise independently. Gonorrheal arthritis is usually limited to the joints. Streptococcus or staphylococcus infections usually invade the medulla of the bone if the infection of the joint is the primary focus. The affected joint may become dislocated, and a "flail joint" be produced, or ankylosis may follow the infection.

**Symptoms.** The first symptoms are those of acute infection. The temperature fluctuates widely, and may reach 105° F. at times. More commonly the fever does not exceed 102 F°. Chills occur at irregular intervals and are followed by rise in temperature.

Pain and tenderness of the joints follow the onset within a few hours or, rarely, a few days. The affected joints become swollen and red; and the skin over them is red and sometimes shiny, as in chronic arthritis in adults. Fluctuation may or may not be recognizable. One or several joints may be affected, and there may be a succession of joints affected in series. In these cases meningitis, pneumonia, pericarditis, or some other visceral inflammation frequently terminates life. In less severe cases, only one or a few joints are affected and recovery follows.

**The blood** shows marked neutrophilic leukocytosis, and some degree of secondary anemia.

The kidneys are always affected to some extent. There may be only a trace of albumin or a few hyaline casts, or the urine may show evidences of serious renal disease, purulent or toxic.

X-ray plates give excellent information as to the extent of the injury.

The order in which the joints are involved is about as follows: Hip, knee, shoulder, wrist, ankle, elbow, small joints of hands and feet.

When several joints are involved, the disease resembles acute articular rheumatism. Children young enough to have acute infectious arthritis are not old enough to have articular rheumatism. Syphilitic epiphysitis may cause confusion in diagnosis, but in this there is no fever or constitutional symptoms, and the progress of the disease is much slower.

Gonorrheal arthritis may be slight, disappear soon, cause no suppuration, and leave no evil after effects. Other infectious agents almost always cause suppuration.

**Treatment.** Avoidance of infection is the most important prophylactic measure. Babies of the age most subject to this arthritis are not exposed to these infections except by carelessness or ignorance, or extremely rare accidental circumstances. Prevention of vertebral lesions or their immediate correction is important in prophylaxis.

Ice bags or cool wet dressings applied to the infected joints may relieve the pain. Sometimes the ice bag or a hot water bottle applied to the back over the area of origin of the sensory nerves to the affected joint gives relief.

Immunity is increased by treatment over the splanchnic areas, and this should be given even if no bony lesions can be found. An area of rigidity is always present, and this requires relief. Any lesions found should be corrected.

As soon as pus accumulates, the joint should be opened and drained. The joint should then remain quiet until recovery.

With the relief of the fever and the disappearance of leukocytosis, if the joint can be moved without pain, very gentle manipulations should be given; first around the joint, and then, with great care, causing the movements normal to the joint. These manipulations must not be begun while there is any danger of spreading an active infectious agent, but they must not be delayed until the adhesions are strong and the mobility of the joint diminished. The dislocated joint should be manipulated in very gentle attempts to restore the normal structural relations, always avoiding movement in the joint during active infection, and exercising great gentleness at any time. These manipulations should be kept up as long as any structural changes can be secured. Many of the flail joints and stiff joints due to this infection could be corrected in some degree if not completely, by this care.

**Prognosis.** Gonorrheal arthritis may not leave any evil consequences at all; or a certain amount of stiffness may result. Other infectious agents tend to invade the subserous and bony tissue, and these are apt to result in more or less permanent injury to the joint.

### STILL'S DISEASE

(Chronic Polyarthritis; Atrophic Arthritis)

This chronic arthritis of children was first described by Dr. George Frederick Still at about the end of the eighteenth century. The disease may be due to any one of several infectious agents, and it is characterized by chronic non-purulent inflammation of the joints, enlargement of the spleen and hyperplasia of lymphoid tissue generally.

**Etiology.** This type of arthritis may follow any one of the acute infectious diseases. Scarlet fever is the most common of these, and acute articular rheumatism is occasionally followed by this chronic arthritis. A chronic neglected or cryptogenic pus focus appears to be responsible in some cases. Very often no source of the infection can be found, even after the most thorough examination.

Rigidity of the lower thoracic spinal column is invariably present. This lesion is known to lower the resistance to infections generally, though the exact mechanism has not yet been determined.

**Pathology.** The affected joints may be few or many. The synovial membranes are thickened, edematous and hyperemic. The synovial villi are hypertrophied, and these villi may erode the edges of the cartilages. New tissue may be formed beneath and within the membranes, and in the capsule of the joint. There may or may not be much fluid in the joints, and this fluid is usually clear, never purulent. The ends of the bones of the affected joint show marked osteoporosis, and atrophy is associated with the arthritis.

The spleen is always enlarged, and the lymph nodes of the entire body are usually enlarged. These lymphoid tissues show hyperplasia but no changes pathognomonic of the disease. The liver is occasionally enlarged; this seems to be due to hyperemia and edema rather than to any characteristic pathological condition.

**Diagnosis.** The symptoms are usually characteristic; these joint changes are not found in any other disease.

The onset varies; there may be sharp fever and almost immediate pain and swelling of the joints, or the onset may be gradual. There may be fever of an irregular and atypical type for several weeks before the joint-changes occur.

The joints affected are usually symmetrical and multiple. The shoulders, wrists, elbows, fingers, ankles, feet and knees are most commonly affected. The sternoclavicular and mandibular joints, and the joints of the spinal column are less often involved. The affected joints are swollen and sensitive to the touch and to temperature changes. They give a doughy feeling on palpation. The skin over these joints is thin and shining. Pressure upon the joint is not painful, or is only slightly so, but any attempt, either active or passive, to secure normal movement causes distress. During sleep or anesthesia it is impossible to secure normal motion in the joints on account of the changes in the articular and periarticular tissue changes.

After a few weeks the fever may disappear entirely, though the joint changes persist. In other cases the fever continues, either low and changeless, or with irregular fluctuations.

The lymph nodes in the pathway of the drainage of the affected joints are always enlarged, and there may be many enlarged nodes in the body which do not seem to be in any way related to the affected joints.

The spleen is almost always considerably enlarged, and there may be dull discomfort in the splenic area.

The X-ray shows the thickening of the articular and periarticular tissues, and the osteoporosis of the ends of the bones.

The affected joints become flexed stiffly. Deformity may become great, and rarely it may render the patient unable to dress himself, or, in later life, to engage in any physical effort.



The general health is not affected after the fever ceases. Inter-current diseases may terminate life at any time.

Recovery may occur at any time, without any recognizable cause or any new treatment.

**Treatment.** The most important factor is the search for some focus of infection anywhere in the body, and, if possible, its removal.

The entire spinal column, the ribs, and, indeed, the entire skeleton should be examined in the search for lesions which might lower immunity. The lower thoracic spinal column and the ribs are most important; and these must be constantly watched and kept normal in flexibility and in structural relations.

The diet should consist of milk, an abundance of fresh fruits and vegetables in season, and of dried fruits and vegetables when the fresh ones cannot be obtained. Oranges and other citrus fruits may be given in moderation, according to the age of the child. Water must be given very freely.

The general hygienic condition must be kept as good as possible. Change of climate, especially from a rigorous climate to one in which much outdoor life is possible, may give much help.

If the inflammation persists, infusions of normal human blood may lead to almost immediate improvement and ultimate cessation of the process.

**Prognosis.** If the primary infectious focus can be found and removed, and if the further treatment is sensible, recovery may be expected. Marked thickening of the joints may persist, but if there has not been recognizable atrophy of the bones, nor any great formation of new tissue, the joints may return to practically their normal condition. If the inflammatory process is not checked, the deformity may become great, but rarely it totally disables the child. If the inflammation is very severe and persistent, amyloid degeneration of the liver, kidneys and other organs may lead to death.

### NON-INFECTIOUS CHRONIC ARTHRITIS

Children suffer less often from chronic arthritis than do adults. A hereditary tendency is usually present in these cases.

**Chronic gouty arthritis** may, though very rarely, occur during childhood. Uratic deposits and tophi are rather more common and more abundant in children than in adults with the same disease.

Villous arthritis is characterized by over-growth of the villi of the joints, caused by chronic inflammation of any kind.

**Atrophic arthritis deformans** (atrophic arthritis; rheumatoid arthritis) depends upon some cause not yet known. The affected joints become greatly deformed. The onset is with swelling of the soft tissues around the joint, and this is followed by atrophy of the

joint and the cartilages. Few or many joints may be involved, simultaneously or consecutively. It is not often possible to make the diagnosis unless an X-ray plate is examined.

Treatment includes, as the most important factor, the correction of the lesions, always found in the spinal column near the spinal segments which innervate the affected joints. Hygienic conditions and diet should be studied, and any faulty conditions eliminated. Infusions of normal blood may give good results. The disease can be arrested in nearly all cases. The tissue changes are permanent, so far as bone and cartilage are concerned. Deformity due to edema disappears with the improvement of the circulation in the affected areas. Atrophy of the soft tissues around the joint and ankylosis of the joint are permanent. Orthopedic surgery may relieve the ankylosis.

**Hypertrophic arthritis deformans** (chronic osteoarthritis; chronic rheumatoid or rheumatic arthritis). In this form the onset is the same as in the atrophic form. The ends of the bones, and especially the bony areas adjacent to the synovial membranes, become greatly increased in size. A true hypertrophy of the bone results. Atrophy may follow the hypertrophy. Atrophy of the soft tissues around the joints increase the apparent deformity in many cases.

Treatment is that of the atrophic form. A greater degree of deformity and ankylosis is permanent than in the atrophic form. Orthopedic surgery may correct the ankylosis.

## CHAPTER LXII

### NON-ATROPHIC DISEASES OF THE MUSCLES

During childhood the muscles are subject to several hereditary, congenital, constitutional and traumatic diseases. Malformations are interesting, but usually either produce no symptoms, or they are not compatible with continued existence.

#### Malformations

Variations in the origin or the insertion of muscles are very common. These slight deformities do not cause any ill effects, and are recognized, if at all, only during dissection or at autopsy.

Congenital absence of the pectoral muscle, especially absence of the lower part of the muscle on one side, is not very rare. Absence or defect of the trapezius, serratus, quadriceps or any other muscle is less common. Abnormally flat chest wall may be due to the pectoral deformity. Sprengel's deformity is the abnormally high shoulder caused by absence or defect of certain muscles of the shoulder girdle. These defects rarely interfere with the life of the individual, because with development other muscles are brought into use and complete compensation is usually secured.

Congenital absence or defect of the abdominal muscles is a rare but very serious deformity. The abdominal wall is very thin over the abnormal area; breathing is interfered with, and death usually occurs during early infancy from bronchitis or pneumonia.

#### MUSCULAR RIGORS

The various types of rigor occur rather frequently in children. Rigor occurs as the result of excessive heat, excessive cold, and diminished alkalinity of the tissue fluids. Excessive cold is not a cause of rigor during life.

Excessive body heat, such as that of high fever, may cause rigor in children. Diminished alkalinity is present in such fevers, also. This rigor is associated with edema of the muscle cells, cloudy swelling of the cell protoplasm, and probably heat precipitation of those globulins which have the lowest coagulation point. After the temperature is diminished, the injured globulins must be absorbed and eliminated and the muscle cells must undergo processes of recovery. The muscles of the child are very weak after such fever and convalescence is tedious.

The rigors due to diminished alkalinity of the tissue juices are more common. The most marked of such rigors are local, and the spinal muscles are more frequently affected. Lesions of the vertebra cause edema of the neighboring tissues; this exerts pressure

upon the nerve trunks and the sympathetic ganglia of the same region, and thus the spinal muscles suffer from lack of normal vaso-motor control and from the effects of pressure upon their motor nerves. The muscles so affected become swollen, edematous and hypersensitive; the muscle fibers suffer from rigor, and the condition is that of a mild form of contracture. In healthy children the muscles rarely suffer the marked changes found in adult muscles, such as fibrosis and definite contracture, but the muscles of children who are poorly nourished and inactive may pass through the changes found in the muscles of adults in whom spinal lesions have remained uncorrected for a long time.

Children who suffer from acidosis, malnutrition, any wasting disease, those with cardiac inefficiency, and those who live in unhygienic surroundings may be affected by a generalized and rather slight muscular rigor. The muscles of the body are found hardened on palpation, they are slightly swollen, edematous, hypersensitive, and weaker even than the poor health of the child seems to indicate. The condition does not go on to true atrophy, and with return to normal health and removal to hygienic surroundings the muscles regain their normal tone and take up their normal development.

The diagnosis of these forms of rigor is made by palpation and by the history of the causative factor.

The treatment consists in the removal of the etiological agents, and in maintaining proper exercise and food. Recovery is to be expected when the conditions which cause the rigor are removed, but return to normal strength may be somewhat delayed.

### PERIODICAL PARALYSIS

This disease is rare and interesting. It is hereditary or familial, and may persist until after the climacteric in either sex. While the disease may appear first during early childhood, perhaps when the child begins to walk, it usually appears first at puberty. No abnormal tissues are to be found in specimens of excised muscle, nor in the muscles removed post mortem.

The attacks may be of daily occurrence, or may appear at intervals of weeks or months. When the child awakens it is found that a flaccid paralysis involves the muscles of the lower limbs, and this extends so that presently nearly all of the muscles of the body are involved except those innervated by the cranial nerves. There may be some difficulty in swallowing. Sensation and mentality are not affected. The electrical response of the affected muscles is greatly diminished and may be absent even to very strong currents. The attack may pass away gradually within a few hours, or within a few days. The muscles seem to regain their normal strength completely.



During the attack there may be profuse perspiration; retention of urine and symptoms of acute dilatation of the heart.

Many attacks seem to occur spontaneously, but over-fatigue or excitement may initiate the attack.

The diagnosis is easy; no other disease is characterized by these symptoms. The electrical reactions exclude hysteria.

**Treatment.** Any abnormal structural conditions found on examination should be corrected. The diet should be kept under control, and any cause for toxemia removed. Abundant fresh fruits and vegetables should be given, with dried or canned fruits and vegetables if the fresh ones cannot be secured. Citrus fruits are excellent.

Excitement and exhaustion are to be avoided.

**Prognosis.** Rarely the paralysis and cardiac dilatation cause death. After the climacteric the attacks usually cease, and they may cease at any time.

### ACUTE MYOSITIS

Acute inflammation of the muscles is a common affection among children, especially those between the ages of five and fifteen years.

**Etiology.** Exposure to cold, especially in unhygienic surroundings, is the most common cause. Children with vertebral lesions are prone to myositis of the larger muscles innervated from the corresponding spinal segments. Poorly nourished children are not more often affected than are those who are well-fed, but those living in poorly ventilated houses and in unhygienic surroundings are more commonly affected.

**Symptoms.** The affected muscles are painful, swollen and stiff. Slight fever may be present. Contraction of the muscle causes acute pain. Nausea and anorexia are commonly found when the affected muscles are anywhere around the neck.

Several names are applied to the condition, according to the location of the affected muscle.

### Types

**Acute torticollis**, or cervicodynia, is an inflammation of the muscles of one side of the neck, most commonly the sternomastoid, the trapezius or the scaleni. The face is turned away from the affected side, and the head drawn downward and toward the affected side. The inflammation is sometimes of rheumatic origin, but it may be due to lesions of the occiput or of the upper cervical vertebra.

**Torticollis** may be present at birth, or may appear within a few days after birth. It may be due to congenital deformity of the muscles, with shortening on one side, or it may be due to hematoma of the muscles of the neck, produced by trauma during birth.

Rarely torticollis is caused by caries of the cervical spine, by pressure caused by an inflamed cervical lymph node, or by an abscess in the neck. An abnormal condition of the spinal accessory nerve may stimulate unduly the sternomastoid or the trapezius, or such injury may paralyze the muscle on one side, thus permitting the unaffected muscle of the other side of the neck to draw the head toward the healthy side.

**Pleurodynia** is a myalgia of the intercostal muscles. It may affect one or both sides, and may be so severe as to lead to an erroneous diagnosis of pleurisy.

**Lumbago**, a myalgia or myositis of the lumbar muscles, is not so common in children as in adults. There is severe pain across the back, "the small of the back", which is greatly intensified on movement. The pain may be absent during complete rest.

**Cephalodynia** is a myalgia of the muscles of the head. Headache is the most common symptom.

**Omodynia** or scapulodynia is a myalgia affecting the shoulder muscles. It is not common in childhood.

**Diagnosis.** In myalgia there is tenderness on pressure over the muscle, but not over the trunk of the nerve which supplies the muscle. The latter point differentiates neuritis. The fact that no friction sounds or other pulmonary sounds are found differentiates it from pleurisy.

**Treatment.** For cephalodynia, correct the inevitable occiput and upper cervical lesions. For pleurodynia, correct the rib lesions, and such spinal lesions as may be found on examination. For lumbago, correct the iliosacral lesion, or the fourth lumbar lesion as may be determined by examination. For torticollis, correct the cervical lesions.

It is usually necessary to relieve the pain and tenderness before attempting corrections. Hot applications give relief; if hot water bottles are used they should be filled frequently. Chilling results in more severe pain. An electric pad which has a good control is very good. Moist heat, such as steam, may give speedy results, but chilling must be avoided. In very severe cases, a moist cloth or heavy paper may be laid over the painful areas, and this ironed, using an iron moderately heated. The massage secured with the heat and pressure is often very helpful.

Drugs are often suggested, but they rarely give even temporary relief, are always injurious to some degree and may even increase the frequency of the attacks.

Abnormal relaxation of the lesioned joints may be found; in this case corrections should be followed by the application of adhesive strips across the joints and extending for several inches

away from them. Adhesive strips over the painful muscles, applied after the pain has been relieved in any way, may prevent recurrence of the pain for some hours.

**Prognosis.** In true myalgias, recovery is to be expected within a few hours or a few days. In congenital cases, improvement follows persistent treatment, but completely normal structure is not to be expected.

### CHRONIC MYOSITIS

Several types of inflammation are found in the muscles.

Nonsuppurating myositis may be due to rheumatism or to bacterial toxins. Rheumatic myositis is identical with myalgia. This disease is characterized by pain, stiffness and weakness of the muscles. Suppurating myositis usually has a history of trauma, with subsequent infection by almost any of the pyogenic bacteria. The diagnosis rests upon the localized pain, the history of trauma and the development of the abscess. Leukocytosis is that of any purulent infection. Treatment is that of abscess in any other part of the body.

### MYOSITIS OSSIFICANS

This is a disease for which no cause is known. It occurs associated with other deformities in about 75% of all cases; it rarely is congenital, and the type of ossification suggests that the disease is really a fetal or embryonic dyscrasia.

The disease appears first in the muscles of the neck, shoulder or upper part of the back. Fever and pain in the affected muscle first appear, then edema and swelling, with increase in the connective tissue. This new connective tissue undergoes ossification, and the tumor thus formed increases in size until it may be as large as an orange. The favorite site for this tumor formation is at the musculo-tendinous junction. The bony nodules may entirely prevent motion in the joint controlled by the muscle affected. As ossification progresses, the pain disappears. After several muscles have been affected the disease progresses slowly and steadily without further discomfort. Exostoses of the bones are commonly found also. When the masseters are affected the patient may be unable to open the mouth. Trauma of any muscle, even the slightest, seems to lead to the formation of a bony tumor at the site of injury.

**Diagnosis** is easy; no other disease is associated with these bony nodules.

**Treatment** has, so far, been of no avail. The children so affected should be given normal hygienic conditions and wholesome food. Any games which lead to very slight trauma must be forbidden, and not even the most insignificant injury be permitted.

**Prognosis.** The disease does not interfere with life, except as the tumors in the masseters may prevent the eating of solid food. There is no hope of cessation of the disease, though intermissions of several years may occur. The bony nodules increase in number and in size until the joints of the body become completely immovable.

Death results from some intercurrent disease.

### DERMATOMYOSITIS

(Myositis fibrosa; Polymyositis; Primary simple edematous myositis)

This is a rare disease at any time of life, but is rather more often found among children than adults. It is an inflammation of the muscles, acute, subacute or chronic, associated with various cutaneous and constitutional symptoms.

**Etiology.** The cause of the disease is unknown. The symptoms suggest an infectious origin, but no infectious agent and no contagion have been noted. No cases have been reported in osteopathic practice. The individuals affected are usually those previously in good health.

**Symptoms.** The onset is abrupt, with fever, heavy perspiration, headache, diarrhea, vomiting, stomatitis, pharyngitis, anorexia and vague pains in the back and legs. Within a few hours or a day or two the back, legs and thighs become painful and the muscles of the lower extremities rigid. The muscles of the body are affected in order until the entire body may become stiff and extremely tender. Contractures may appear, and these cause great pain.

Edema may appear with the fever or as it diminishes. The eyelids often show the edema first, but in other cases the edema appears only over the affected muscles.

Dermatitis is always present. Erythema may be widespread, or may cover the affected muscles only. Skin lesions resembling those of urticaria, erysipelas, eczema, rosea or erythema nodosum may occur.

During the later progress of the disease the fever may be constant, intermittent or remittent. The perspiration is usually profuse at intervals, accompanying or alternating with the fever.

The muscles of the pharynx, the diaphragm and the heart are involved later, in the severe cases, and the muscles of respiration are also affected. These lead to death within a month or two after their onset. Rarely the child recovers. Intermissions are common; they may last for months or years.

**Myositis fibrosa** is probably a milder type of the same disease. Dermatitis and edema are absent. The muscles slowly become hardened by overgrowth of the connective tissue. There is no fever,



little pain, and the disease usually ceases with the involvement of certain muscle groups of the limbs.

**Treatment** is unavailing so far as the progress of the disease is concerned. Lesions as found should be gently corrected. Rest, the application of heat and cold to the painful areas, and other measures for the relief of the pain are indicated during the painful periods. During the fever inhibition of the splanchnic centers often gives relief. For the diarrhea and vomiting during the first few days, the usual methods for securing relief are indicated.

While there is no reason to suppose a lack of vitamins is responsible for the disease, it does bear some resemblance to deficiency diseases, and the diet of the child should include abundance of the vitamin-containing foods, with rather low carbohydrate and low protein foods. Water should be given abundantly. All good hygienic conditions should be provided. After the inflammation has subsided the atrophic muscles should receive massage and carefully graded exercises be outlined.

**Prognosis.** Myositis fibrosa is less often fatal than is the acute form. Its course is more gradual, and the progress of the disease may cease at any time.

## CHAPTER LXIII

### THE PRIMARY MUSCULAR DYSTROPHIES

(Progressive Muscular Dystrophies; Primary Myopathies)

Muscular dystrophies and atrophies may be primary, in which the disease originates in the muscle itself, or secondary, in which the muscular disease is caused by some disease of the central nervous system or the peripheral nerves. The primary muscular atrophies alone are discussed in this chapter; the muscular diseases due to nervous disorders are considered with the nervous diseases.

**Etiology.** Heredity is the only etiological factor now recognized. Isolated cases occur, even in families with well known history covering several normal generations. The disease is much more common among boys, but the heredity is transmitted by the mother.

**Tissue changes** are probably identical in the several types, and it is the variations in the relative preponderance of the hypertrophy, fatty degeneration and atrophy, the variations in the speed with which these changes occur, and the variations in the muscle groups affected, which differentiate the types. Certain of the muscle fibers first hypertrophy, with multiplication of the nuclei. This hypertrophy is always present to some extent, and it may be very pronounced. Fatty degeneration may follow or may be associated with the atrophy. Increase in the interstitial tissues follows. Atrophy affects all of the muscle fibers, and this is followed by even more marked proliferation of the connective tissues. These changes are much like those due to lesions of the central nervous system or the peripheral nerves.

Whether hypertrophy precedes atrophy or not, extreme wasting of the muscles finally occurs. With this wasting fibrosis and atrophy, the muscles become contracted and the limbs may be drawn into awkward positions, when the limb muscles are affected.

#### Types of Dystrophies

**Pseudohypertrophic muscular dystrophy** (Pseudohypertrophic paralysis) is the commonest type, and the most easily recognized. Isolated cases are occasionally found, but more frequently the disease is distinctly hereditary or familial. Heredity follows the peculiar plan found in several other diseases. Males are more often affected, and the disease is transmitted most commonly by females, themselves normal, who transmit the disease to male offspring. Several children in one family may suffer from this disease.

The symptoms are usually noted first in early childhood, often soon after the child begins to walk, but occasionally much later. Very rarely the symptoms are first noted after puberty.

The onset is gradual, with increasing weakness of the legs. Stumbling and falling become more and more common. He becomes increasingly more awkward in the leg movements. After a variable time, certain muscles of the legs, usually those of the calf, begin to

enlarge; this attracts attention especially because the large muscles are so weak. Other muscles of the body undergo atrophy without showing hypertrophy in most cases, but occasionally there is hypertrophy of the muscles of the thighs, back and shoulders after the calf muscles have been affected for some time.

The posture is significant. He stands with the shoulders thrown far back and the legs far apart; the lumbar curve is thus greatly exaggerated. The gait is peculiar; the child lifts the pelvis very high, on account of the weakness of the gluteal muscles, and sways the body from side to side in a waddling manner. If he rises from the floor, he assumes odd positions; he rises upon the hands and feet, then puts one hand upon the knee, then rises enough to put the other hand upon the other knee, then he places first one hand then the other higher upon the legs until he can stand erect. This gives him the appearance of "climbing himself".

As the muscles become atrophied and their substance filled with connective tissue, various contractures occur, causing deformities and incapacitating the child for active movements.

Hypermobility of the shoulder, on passive movement, is present after the development of the dystrophy, so that if an adult attempts to lift the child by the thorax the hands of the adult slip upward as the child's shoulders raise beneath the slight pressure.

Lordosis soon becomes marked, and ultimately reaches an extreme degree. Great deformity results from these structural changes, with the contractures of the muscles.

The order in which the muscles are affected sometimes varies. The tongue may be hypertrophied to such an extent that it cannot be replaced in the mouth. Griffith reports a case in which the entire body was extremely emaciated, except the tongue, which was of tremendous size.

The disease progresses very slowly in most cases. The younger the child at the first symptoms, the more rapidly does the disease progress. After puberty the course is even more gradual. Remissions are frequent, but the disease often progresses more rapidly following the remission.

The strength of the child diminishes steadily. Finally the wasting becomes extreme, and the child is unable to make any effort; he may be able to use his hands only, and these slightly.

Death usually occurs from some intercurrent diseases, before puberty. In a few cases death occurs from weakness and prostration.

**Scapulo-humeral type** (Erb's Juvenile type). This type may not appear until puberty or even adult life. The atrophy begins without apparent hypertrophy of the muscles, though some hypertrophied fibers may be found in the excised muscles or those removed post

mortem. The muscles of the shoulder girdle atrophy, then those of the upper arms, the back and the thighs. The muscles of the forearms, hands and feet usually remain normal.

**Facio-scapulo-humeral type** (Landouzy-Dejerine). This form begins in early childhood. The muscles about the mouth and other facial muscles are first affected. The face becomes expressionless, the lips are protruded, it becomes impossible to close the mouth. The "tapir mouth" is thus produced. The muscles of the neck, arms, trunk and legs become atrophied in turn. No appearance of hypertrophy is found in this dystrophy.

### Diagnosis

In all types of dystrophy the disease progresses slowly from one muscle group to another. The tendon reflexes are always slowly diminished and finally lost. True reaction of degeneration, such as is present in muscular atrophy due to spinal disease, is never present in these primary dystrophies. Electrical reactions are always diminished, and may be lost. Fibrillary tremors are very rare. The splinchners, sensation and mentality are not affected, or are very slightly affected by the disease. Hyperglycemia, low blood creatin and urinary creatin have been found in some of these children.

### Differential Diagnosis

Usually the diagnosis is easy. Rarely the disease may be confused with others. Muscular atrophy due to spinal disease affects first the distal ends of the limbs, fibrillary tremors are usually recognizable, and the muscles give the reaction of degeneration. Atrophy due to disease of the nerve trunks also affects the distal regions first, and sensation is also affected.

Syringomyelia is associated with sensory and sometimes vasomotor disturbances. Amyotonia congenita has its congenital origin, the flaccidity without atrophy and has no tendency to spread.

### Treatment

Since the disease is due to some inherited weakness or abiotrophy of the muscles no treatment can be very efficacious. If any indication of endocrine disturbance can be found, these extracts may be supplied. Fatigue is to be avoided, and the diet must be wholesome. Massage seems to delay the progress of the disease in some cases. Any treatment which increases the nutrition of the body as a whole is indicated.

Very few cases have been reported in osteopathic practice. In a few cases the progress of the disease seems to have been diminished, in others the progress of the disease remained unaffected, but the general health of the child improved considerably.



**MYOTONIA CONGENITA**

(Thomsen's Disease)

This disease is rare but may be found occasionally. It is found in children exclusively, and is characterized by a peculiar stiffness of the voluntary muscles when they are brought into action after a period of rest.

**Etiology.** The disease is distinctly familial or hereditary, though a few atypical cases have been described without family history of the disease. Boys are much more often affected than girls, and the disease is most commonly transmitted by a maternal grandparent. Several members of the family may be attacked.

**Tissue changes** are found in the muscles affected. The muscle fibers are increased in size to some extent; the strength of the muscle is not so great as might be expected from its size. The nuclei of the muscle fibers multiply considerably, and the protoplasm of the muscle becomes filled with many yellowish or colorless granules. This deposit of granules is characteristic. The perimysium may be somewhat increased. No evidence of degeneration or of atrophy is to be found. Some observers have found the nerve endings scanty and have therefore included the disease among those of the nervous system.

**Symptoms.** During rest no abnormality is perceptible. After rest, the first voluntary efforts are very difficult; the muscles seem very stiff, but no ataxia is evident. After a minute or a few minutes the desired movement can be initiated, and after several minutes the movement can be initiated normally. The attempt to walk, for example, presents great difficulty but no loss of balance or other ataxic factors. After much effort the first step is taken, with less effort the second step, and after a few steps the child walks with little or no effort, normally. As long as he continues walking, he is able to walk easily, but if he should step up or down, or should stop and rest for a few minutes, the initial difficulty is repeated.

The muscles of the legs are usually affected. The arms, back or tongue may be affected, either alone or associated with the disease of the leg muscles.

Percussion upon the muscle causes a slow tonic contraction which disappears very slowly. The excitability of the muscles to any stimuli is increased. Faradic and galvanic stimulation causes contractions which persist much longer than in health. Anodal closing current causes greater contraction than cathodal closing current. When a constant stimulation is effective slow wave-like contractions may be seen passing from the negative to the positive pole. Reflex stimulation of the myotonic muscles produces normal contractions. Sensation, nutrition and mentality are usually normal.

**Diagnosis** is based upon the characteristic muscular rigidity and the family history, with the characteristic electrical reactions. Slowness of movement alone is not characteristic. Tetany may be confused with myotonia, but the contractions differ greatly and the

electrical reactions are distinctive in both diseases. There is nothing in common with myatonia congenita, except the unfortunate and puzzling similarity of names.

**Treatment** may give some intermission and some improvement, but complete recovery is not to be expected. Such structural conditions as may be found on examination should receive due attention. Massage and passive movements of the affected muscles encourage improvement. Exercise is to be freely given, but not to the point of fatigue.

**Prognosis.** The disease persists throughout life. Remissions may occur, during which the rigidity diminishes considerably, but never do the muscles become normal. It does not shorten life, directly, and some intercurrent disease may lead to death. Occupations may be hindered, but by the time adult life is reached these individuals are usually able to engage in some useful occupation in which the muscular disorder is not important.

### AMYOTONIA CONGENITA

(Myatonia Congenita; Oppenheim's Disease)

This rare disease was first described by Oppenheim in 1900. It is characterized by great flaccidity of the muscles and absence of the tendon reflexes. It is usually present at birth, and there is a very slow improvement but never complete recovery. The muscles are very weak, but are never paralyzed. Sensation and mentality are not at all affected. Contractures follow the muscular flaccidity. Characteristic electrical reactions are present; the faradic excitability is greatly lowered, and very strong faradic stimuli are borne without complaint.

While the disease is distinctly congenital, the first symptoms may not occur until the child begins to use its arms, or to walk. The muscles of the legs and thighs may be affected alone, or, more rarely, the muscles of the entire body except those innervated by the cranial nerves may be affected. The sphincters are very rarely affected. In very severe cases, the muscles of respiration alone are active; all other striated muscles may be completely without function.

The affected muscles are very soft and flabby, but atrophy does not occur. The joints are abnormally flexible, and the shoulders may be brought together in front of the thorax; the legs brought parallel to the thighs, the lower arm be brought parallel to the upper arm and other remarkable feats may be produced easily.

The diagnosis is easy. No other disease presents any similarity to this in the flaccidity of the muscles without atrophy or sensory disturbances.

**Tissue changes** are characteristic. The muscle fibers show many nuclei (which is an embryonic characteristic of muscle), and are greatly diminished in size. The connective and fatty tissues are increased, and the size of the muscle is not affected.

The motor nerves are often found with deficient medullation, and absence of nerve endings has been reported. No changes are found in the central nervous system. Whether the changes in the peripheral nerves are due to the muscular defect, or are the cause of the muscular defect, or whether both abnormalities are due to some pre-existing cause, is not yet determined.

**Treatment.** Such rigidities as are found in the spinal column or the spinal muscles should be corrected. Carefully graded exercises should be given. Massage and passive movements are useful. Good hygienic and dietetic conditions are indicated, as for any child, ill or well. Hypothyroidism is sometimes present, and thyroid extract should then be administered. If the muscles are extremely weak, electrical stimulation, given in moderation, may so stimulate them as to make voluntary movements possible. This treatment must be maintained with persistence, even though the improvement is slight.

**Prognosis.** Life is not affected by the disease; indeed, these children are less subject to accidental trauma and infection than are normal children. The weakness of the respiratory muscles makes them more liable to respiratory diseases. Several such children have died from pneumonia or some intercurrent disease. According to Oppenheim, slow and steadfast improvement is to be expected, without any treatment. With persistent and sensible treatment, the improvement is facilitated, and is probably made more nearly complete. In any case, there is no hope of completely normal development. In many cases the disease progresses, and it may remain unchanged for years.

Rarely the improvement may be sufficient to permit the child to walk; usually they never become able to stand alone.

## PART IX. DISEASES OF THE NERVOUS SYSTEM

### CHAPTER LXIV

#### Introduction

No satisfactory classification of the diseases of the nervous system is possible. In this discussion, the most convenient arrangement has been selected, without regard to anatomical divisions, etiological factors or pathological changes.

In a normal child at birth, the nervous system is complete in all of its elements, but not in all of its processes—such as myelination of fibers and isolation of special paths, so that delays in conductivity and coordination are normal. Bodily functions, such as evacuation of the bowels and bladder, are under spinal control, cerebral inhibition developing later. Sensations like hunger and thirst can be recognized in the first few days of life. A baby's sense of taste develops early as well as the perception of light and reaction to sounds of varying intensity.

The rapid growth of the brain and cord and the ready exhaustion of the nervous centers, together with disturbances of nutrition, form the underlying causes of nervous diseases peculiar to the early years of life.

It is impossible, therefore, to over-estimate the importance of the hygiene of the nervous system in infancy and childhood. Consideration of this fact makes rest and sleep amidst quiet surroundings of paramount importance, and the use of stimulants—tea, coffee, alcohol—and all forms of undue and unnatural excitement absolutely prohibitory.

During infancy and childhood the proportionate weight of the brain and spinal cord is much greater than it is during later life. According to Holt, the weight of the brain is nearly one-eighth the weight of the body, and the weight of the cord about one five-hundredth the body weight. The body increases in weight more rapidly than does the nervous system, so that at the fourteenth year the brain weighs about one-twentieth the body weight. In adult life the brain weighs about one-fortieth to one-fiftieth the body weight, and the cord about one-fifteen-hundredths.

This relatively large size of the nervous system, its comparative immaturity and its rapid development during childhood predispose to functional nervous disorders, and render structural diseases of comparatively slight extent able to cause extremely serious symptoms.

For the same reasons, the effects produced by drugs, tea, coffee, excitement, disturbances of sleep, and over-exertion of any kind are much more serious than is the case during adult life.



Lesions of the cervical vertebrae are often caused during birth, or by improper handling after birth. These interfere with the circulation through the brain, and are often responsible for delayed development of the brain, and for increased irritability of the nerve centers, thus permitting the development of functional nervous diseases without any other recognizable etiological factors, or upon the occurrence of other apparently insignificant etiological factors.

### CONVULSIONS

Convulsions may be considered as motor discharges from the cortex of the brain, and are characterized by involuntary rhythmical spasm of the muscles, general or local in distribution, and are usually accompanied by loss of consciousness.

**Etiology.** Convulsions may be of organic or functional origin or due to developmental defects such as microcephalus. Under organic, may be included convulsions due to meningitis, cerebral hemorrhage, tumor, abscess, hydrocephalus, thrombosis or embolism. Convulsions from such causes are frequently due to trauma at birth, and therefore appear during the first weeks of life, contrasting in this respect with convulsions of functional origin, which in the most part are due to tetany either latent or active, and do not appear before the end of the first half year of life as a rule, which is a contradiction of the theory that convulsions are a result of the instability of the voluntary centers of the cortex, and shows that this condition does not depend on the insufficiency of cerebral development, but that the instability is a result of tetany. The same thing holds good for indigestion and over-feeding as a general cause of convulsions. Convulsions of this type usually occur in children suffering from tetany, and is only another manifestation of the irritability of the nervous system.

Convulsions appearing at the onset of infectious diseases are apparently of toxic origin. Such diseases as pneumonia, scarlet fever, malaria and whooping cough, are frequently ushered in by convulsions.

Examination of the ears is of importance as a cause of convulsions, as foreign bodies in the external auditory meatus, or otitis media involving the inner ear, may cause meningeal irritation and result in convulsions similar to epilepsy.

Convulsions from an encephalopathy due to lead poisoning from swallowing paint on articles of furniture in the nursery, are not of rare occurrence.

Convulsions ending fatally are often associated with enlargement of the thymus and lymphatic structures. In some of these cases the children were previously healthy, in others, rachitic.

Bony lesions involving the cervical area, and interfering with the circulation to the brain may be a direct cause of convulsions. Too

much emphasis cannot be laid on a thorough osteopathic examination of infants soon after birth, as lesions produced by an instrumental delivery, or a long and difficult labor, can be corrected early, thus obviating the serious sequelae that follow in their train.

Lesions in areas involving the nerve supply to any of the ductless glands, especially the thyroid, may be predisposing causes, since they would play a part in body metabolism, and the causes underlying spasmophilia and rickets.

**Symptoms.** The attack as a rule comes with little warning, occasionally there are prodromal symptoms such as twitching of the muscles of the hands, feet or eyelids, extreme irritability or restlessness.

The first thing noticed is the pallor of the face and convulsive twitchings in the facial muscles or extremities, which rapidly spread until the convulsion becomes general or it may be unilateral in distribution even when not due to a local cause.

The thumbs are buried in the hands, the neck thrown back, there may be frothing at the mouth, and loss of consciousness. The pulse may be rapid or slow, often irregular, always weak. The forehead is covered with cold perspiration, and the face becomes blue, especially about the mouth.

All varieties of tonic and clonic spasm may be seen in all degrees of severity.

During the attack or immediately after, the child often passes flatus, urine and feces. After a variable period of from a few moments to half an hour, the convulsive movements cease, and the child usually falls into a sleep from which it awakens very much exhausted. A not uncommon sequel is a temporary paralysis due to exhaustion of the nerve centers.

Death may occur as a result of a single attack but is rare except in children with status lymphaticus. Where the seizures recur rapidly, death is due to asphyxia or exhaustion.

There may be no sequels from an attack or there may be meningeal hemorrhage or other brain lesion, and the transient paralysis mentioned previously.

**Diagnosis.** There is usually no difficulty in recognizing an attack of convulsions, but the problem presenting itself is to determine the underlying cause. It is necessary, therefore, to go carefully into the history of the case.

Convulsions in the first few weeks of life may be due to cerebral hemorrhage, defective brain development or pressure in a difficult labor, producing circulatory changes which may not give permanent results. Epilepsy is not a likely diagnosis in infancy, as the majority of cases develop later.

Spasmophilia or Tetany is admitted to be the most common cause of convulsions in young children, and the diagnosis of this condition is easily recognized by its many characteristic signs—Erb's phenomenon, Trousseau's sign, carpo-pedal spasm, etc.

Convulsions due to brain disease are accompanied by focal symptoms, such as paralysis or rigidity, and eye symptoms—strabismus and pupillary changes.

When an acute infection is ushered in with convulsions it is invariably accompanied by a high temperature—103 or 104° F., and in children previously well.

Convulsions due to other causes are not characterized by marked changes in temperature, although there may be a slight rise.

**Prognosis.** The prognosis depends altogether on the cause of the convulsions. The various factors determining the danger to the patient are: Youth; the length of the attack; the interference with respiration; the amount of prostration produced by the attack, or already present; the feebleness of cardiac action; the intensity of the cyanosis and other evidences of asphyxia. Asphyxia is the cause of death in short, very severe attacks; exhaustion in the long continued, and frequently repeated ones.

Convulsions occurring as a late condition in pertussis or pulmonary disease are especially fatal, while those occurring at the onset of an acute infection are seldom of moment.

Convulsions due to intracranial disease are serious on account of the nature of the cause of which they are a symptom.

The death rate from convulsions is impossible to estimate on account of the variations in statistics. In many cases, convulsions are given as a cause of death when in reality they are only a terminal symptom of a primary disease.

**Treatment.** Immediate relief by general measures is indicated in an attack of convulsions.

The child should be placed in a warm bath of 98 to 100° F. while a cold compress or ice bag is applied to the head. Mustard packs can be applied to the surface of the body, and a mustard foot bath can be given with the child lying in its crib, if counter irritation is indicated. The nervous centers are in a condition of such unnatural excitability that the slightest irritation may bring on convulsive movements when they have temporarily subsided. The patient should be kept perfectly quiet and every unnecessary disturbance avoided.

Convulsions due to brain lesions do not yield to ordinary therapeutic measures, and in these cases inhalations of chloroform may be used. Chloroform should not be administered by an inexperienced person as disastrous results follow its overuse, and the poison acts

on the liver cells, producing fatty degeneration. Chloral per rectum, magnesium sulphate and morphine hypodermically, may be used in the same class of cases. Morphine should be resorted to only as an extreme measure where the convulsions recur as soon as the effect of the anæsthetic has worn off, the physician bearing in mind that children contract the morphine habit very readily.

The dosage is one-fortieth grain for a child six months old, one-twentieth grain for one year, one-sixteenth grain for a child two years old. The tolerance of opium in cases of convulsions is very marked, so, often the dose has to be increased.

Oxygen is valuable in cases due to asphyxia. Cervical treatment to relieve the cerebral hyperemia, and raising of the ribs in the movements of artificial respiration, in cases of asphyxia are indicated.

Dilatation of the anal sphincter or relief of the tension of adherent prepuce or clitoris may terminate a convulsion.

Treatment in the mid-dorsal region may be effective in case there is digestive derangement, or through the lumbar if there is intestinal disorder.

As soon as the attack is over an enema should be given, although the child should not be distressed or disturbed for treatment immediately after a convulsion for fear of a return attack.

The etiology determines the after treatment, which has to be directed to the underlying cause.

### MECHANICAL INJURIES

Fractures and dislocations of the spinal column are rare during childhood, but do occasionally occur. The symptoms due to injury of the cord on this account depend upon the location of the cord injury, and are the same as those produced in adults by injuries of the same type. Paralysis of the lower neuron type (flaccid paralysis) affects the muscles innervated from the injured segments, and sensation is abolished completely from the site of the injury downward if the injury involves the entire section of the cord. The muscles innervated from segments below the injury show upper neuron paralysis, spastic paralysis.

When the spinal column is broken above the fourth thoracic segment death is probably inevitable very soon. When the injury is below about the tenth thoracic segment life may be indefinitely prolonged. Lack of control of the bladder and the rectum is complete or partial according to the location and extent of the injury. Surgical repair should always be considered in these cases. Sometimes considerable improvement may be thus secured.

Fracture of the skull may occur during infancy or childhood from any one of several accidents. The symptoms thus produced,



if death is not speedy, are those of intracranial hemorrhage (q.v.).

Nerves may be cut, ruptured, or involved in the callus around healing bone. The symptoms depend upon the location of the injured nerve. Surgical union of the nerve ends facilitates regeneration when the nerve has been severed. The absorption of the callus usually leaves the nerve free, but surgical intervention is occasionally required.

During the stage of regeneration osteopathic treatment greatly facilitates the process. Tissues innervated by the affected nerve should be kept in as nearly normal condition as possible. Maintenance of the circulation through the affected area, by means of spinal treatment, avoiding any handling of the affected limb, gives the best possible circumstances for speedy growth of the regenerating nerve fibers.

Concussion occurs as the result of a blow, shock or fall which causes temporary loss of consciousness but which does not cause death or indications of marked tissue destruction or hemorrhage. It is probable that slight tissue changes are always present in concussion, such as circulatory changes, tiny hemorrhagic areas, temporary edema or slight change in the structural relations of the neuronic constituents.

The child which suffers from concussion lies unconscious for a variable period, sometimes half an hour but usually only a few minutes. Sometimes there is not complete loss of consciousness, but only dizziness. Dizziness, hallucinations, amnesia and headache are common symptoms following the loss of consciousness, and soon after the injury the child begins to vomit, and this may be very severe. Aphasia and amnesia may persist for some hours. The pulse may be very rapid or very slow or normal. The child is usually apparently completely recovered within a few hours. If any symptoms persist longer than twenty-four hours, or if the unconsciousness is prolonged beyond an hour, some serious brain injury should be suspected. If epilepsy follows the accident, brain injury is to be strongly suspected.

The neck should always be carefully examined, in order to find any cervical lesions which may have been caused by the accident. Usually such lesions are found, and these must be corrected as soon as is possible. Serious after-effects often supposed to be due to the injury of the brain are really due to the effects of the cervical lesions caused by the fall, blow or shock.

**Treatment.** After any fall or blow which causes any recognizable symptoms the child should be put into a quiet room where he can rest. Hot applications to the feet and the abdomen, and an icebag to the head are indicated. Every mother should know these methods.

As soon as the osteopathic physician can reach the child he should examine the neck and back for lesions, and the respiration, pulse and pupils for evidence of cerebral hemorrhage. Treatment of the neck usually relieves the vomiting. Abnormal tension of the cervical muscles alone may cause uncontrollable vomiting.

**Prognosis** is good if all cervical lesions are corrected and no hemorrhage was caused by the accident. If no lesions were caused by the fall, which is an unusual thing, or if the later normal movements of the neck result in spontaneous correction of the lesions, which is rather more common, recovery may be uneventful without osteopathic treatment. But in many other cases, in which lesions were caused, the osteopathic treatment makes the difference between immediate and complete recovery, and delayed or incomplete recovery.

Epilepsy may occur soon after such an accident, or may not appear for several years afterward.

The severity of the symptoms immediately after the accident, gives no indication as to the probability of later epilepsy.

### INSOLATION

Heatstroke is not an unusual occurrence during the late summer. Babies are less often affected than are children of school age, or somewhat less.

**Symptoms.** Usually the affected child has been playing in the sunshine on a hot day, very often under the urge of nervous excitement or of older children. Less commonly the child may have been playing in a dark, airless place. Sometimes children are compelled to work in hot places. The face becomes very red and somewhat purplish in tint, the pulse rises to 140 or more, and headache becomes severe. Photophobia is common, though there may not have been much light in the place where the attack occurred. The temperature of the child may be increased to 104.5° or more; the skin is very hot, the pupils contracted and the conjunctivae reddened. Nervous twitchings are common, but convulsions are rare in a child who is normal except for the heat. Children lose consciousness as a result of heat much less commonly than do adults.

Still more rarely children suffer from heat more severely. The skin becomes chilly, with slight clammy sweating; the temperature of the body falls below normal, the pupils are dilated and the lids fall partly over the eyeballs. Consciousness is usually lost, and the child is very apt to die unless immediate measures are employed.

Stimulating treatment is indicated. The body may be placed in a warm bath, with or without mustard. Icebags are kept upon the head. Rather sharp, quick, stimulating manipulations should be given throughout the thoracic spinal column. There should be some

slight, quick movement produced at each vertebral articulation. Hot water, hot milk or hot weak tea should be given the child if he can swallow. The entire body may be rubbed, after the bath, with warm flannel cloths.

The ribs should be raised with the respiratory rhythm, either at each inspiration or at every second inspiration.

In serious cases treatment must be immediate. The child should be undressed and put to bed in a cool room. If the osteopathic physician cannot reach the child for a time, the room must be well cooled. A wet sheet, whose lower end rests in a pan of cold water, should be hung where the air will pass it. An electric fan may play across the sheet and thus send damp cool air into the room. Icebags upon the head with warm applications to the feet and abdomen are useful. As soon as the temperature of the child begins to diminish, care is necessary to avoid chilling. Plenty of cool water may be given. No food should be given, but cool drinks, such as water, lemonade, very weak tea with lemon, or diluted milk may be permitted if the child desires more than the cool water.

The osteopathic physician may do much for the relief of the disturbed cerebral circulation. Relaxation of the edematous and contracted tissues around the superior thoracic inlet permits more speedy drainage of the head and also prevents pressure upon the vagus nerves. Inhibition of the splanchnics enables the body temperature to return to normal, and dilates the abdominal blood vessels, thus relieving the blood vessels of the brain and meninges, and diminishing the work of the heart.

**Prognosis.** In milder cases no harm is caused except that the child is less able to endure heat thereafter. In more serious cases, in which the headache is severe and persistent, there is much danger of injury from later slight exposures to heat or sunshine. Possibility of definite injury to the brain substance by coagulation of the globulins is to be suspected in cases with collapse. Recovery may be considerably delayed in these patients, and mentality may be affected.

## CHAPTER LXV

### GROSS STRUCTURAL DEFECTS OF THE NERVOUS SYSTEM

Abnormal structural states of the central nervous system are rather more common than are abnormalities of similar severity of other parts of the body. Neoplasms are included in this chapter, because nearly all of these are due to some congenital abnormality.

#### MALFORMATIONS OF THE NERVOUS SYSTEM

Abnormal structural conditions of the nervous system are due to the causes of deformity elsewhere in the body. The presence of maternal bony lesions affecting the innervation of the uterus must be considered at least one factor in producing deformity. This has been demonstrated by the great percentage of deformities among the progeny of animals experimentally lesioned. The ease with which deformities are secured by exposing eggs to fumes of various drugs, to excess of carbon dioxid, lack of oxygen, or variations of temperature, and by giving mammalian parents certain drugs, or by exposing them to the influence of various abnormal conditions, leads to the view that deformities which are not hereditary are the effect of abnormal environmental conditions affecting the ovum.

The brain and the spinal cord are differentiated from the epithelial tissues at a very early date of embryonic development, and conditions responsible for serious deformities must be active before this development has been completed. After any structure has become fairly well differentiated, abnormal conditions result in pathological changes which may or may not be easily recognizable.

The causes of deformities in general may be responsible in causing these brain defects. In addition, the central nervous system of the embryo and fetus seem to be especially subject to the effects of alcoholism, drugging, and syphilis. There is no reason to believe that the germ cells are less subject to nutritional abnormalities and toxemias than are other cells of the body. It is undoubtedly true that cells undergoing maturation are more easily affected by toxemias and other abnormal conditions than are cells which are more quiescent. Therefore the effects of alcohol and other poisons, malnutrition and other abnormal conditions are more apt to affect the young born of conception occurring at about that time. During pregnancy maternal physiological conditions are important factors in the development of the embryo and fetus, and thus it is evident that maternal physiology is doubly important in modifying the development of the young. The maternal germ cell and the paternal germ cell are equally important in affecting the progeny, while the maternal organism must affect the developing child during the first ten months of its actual life.



The marriage of close relatives is not a cause of cerebral defect, unless some cerebral defect is present in the family already. Any defect tends to be emphasized by intermarriages among relatives. It must be remembered that the fact of cerebral defect often causes the marriage of relatives and thus emphasize the abnormal tendencies.

The place of lesions of the occiput or the cervical vertebrae caused during birth in the etiology of mal-development of the brain must be considered in all cases. Such lesions should be corrected at once, in every case.

Mental and nervous defects seem to follow Mendel's Law in heredity. There is a certain amount of substitution in this heredity, but the serious defects, such as cause feeble-mindedness, idiocy and imbecility are less apt to show the effects of substitution than are the milder neuroses, such as hysteria, neurasthenia and epilepsy.

The place of maternal vertebral lesions as a cause of cerebral defects is not yet well defined. Female animals experimentally lesioned do produce a considerable proportion of young which show cerebral defects, as well as other deformities.

**Tissue changes** vary greatly. Total absence of certain areas may be found, as in porencephaly and other less severe conditions. The site of a hemorrhage produced at birth or shortly after birth may show cerebral defect.

Irregularities of the convolutions are very often found. The sulci may be very fine or very broad; the convolutions may be fine, resembling angleworms, with deep, broad sulci intervening, or they may be very flat and broad.

**Agenesis corticalis.** Macroscopic irregularities may be absent. The microscopical examination of the brain may then show an immature condition of all cells, or great deficiency in the number of the brain cells as a whole, or of any layer or group of layers. The stratum zonale is very often found deficient in cells.

**Microcephalus** is characterized by a very small brain in a very small skull, which is usually prematurely ossified and in which the fontanels are prematurely closed. The deformity of the skull is due to the imperfect development of the brain.

**Hydrocephalus** shows a large skull, but the brain is more or less defective, partly, at least, due to the pressure of the increased amount of fluid within the skull.

**Porencephalus.** This is characterized by loss of the brain substance at some area. There is a depression in the brain substance which may reach the ventricle. The depression is filled with fluid. It seems probable that inflammatory processes, hemorrhages, embolism, or thrombosis cause the loss of brain substance before birth,

as these factors are known to do after birth. The anterior or middle portions of the brain, usually on one side, are most often affected. In serious cases death precedes birth, or follows birth very shortly. In very mild cases the child may live to puberty. Spastic cerebral palsy, occasionally epilepsy, mental deficiency and various convulsive attacks, sleeplessness or stupor may be due to porencephaly.

**Macrocephalus.** This rare condition is an increase in the size of the brain. The skull may or may not be enlarged. The ventricles are subjected to pressure; the convolutions are flattened by pressure against the skull. Mentality is absent or very much below normal. Other symptoms resemble hydrocephalus.

**Meningocele** is a deformity of the cranium characterized by hernia of the meninges into a sack which forms a cranial tumor. An opening through the skull permits the cerebrospinal fluid to pass into and out of the sack. This is the rarest of the cranial hernias, and the simplest to deal with. The tumor is present at birth, and increases in size. It is translucent, smooth, pedunculated, and compressible. It may be possible to press the entire tumor into the cranial cavity, but this usually causes convulsions or other cerebral symptoms. It rarely is visibly pulsating.

In meningocele spontaneous recovery may occur. The sac may be removed and the pedicle ligated. In either case there is apt to be hydrocephalus from retention of an excessive amount of cerebrospinal fluid.

**Encephalocele** (*hernia cerebri*) is much more common than meningocele and is characterized by protrusion of part of the brain substance into a sac. Fluid may or may not be present, and it then covers the external surface of the brain. Other deformities are commonly associated with encephalocele.

The tumor is present at birth, and does not increase in size more rapidly than does the skull. It is not translucent and not often pedunculated. It is smooth, pulsating in synchrony with the heart beat, can usually be reduced, but the pressure due to its reduction causes convulsions or other cerebral symptoms. Harelip, spina bifida and other deformities are usually associated with encephalocele.

Treatment is of little value.

**Hydrancephalocele** is the most common and also the most serious of the cranial hernias. Part of the brain with a central cavity continuous with the ventricles occupies the sac. The tumor is large, often pendulous, often partially translucent, fluctuating, pulsating, and its surface is lobulated or irregular. The tumor cannot be reduced, and pressure upon it causes cerebral symptoms. The condition is hopeless and no treatment is of any avail.

**Heterotopia** of the brain is a deformity in which aberrant masses of gray matter are scattered among the tracts of white matter, usually most abundantly in the internal capsule.

**Anencephalus.** This term is applied to that condition in which the cerebral hemispheres are lacking. The base of the skull is present, and the basal ganglia are more or less completely represented. The cerebellum is usually present, and the spinal cord and pons are usually practically normal. The vault of the skull and the cerebral hemispheres are absent. The top of the head is covered with scalp and this shows the usual hairy structure.

The deformity of the skull and brain is sometimes, but not always associated with deformities of the spinal cord or other parts of the body, and aplasia of the cerebellum. The deformed child may live a few days, if it is given the attention given normal children, but it may be stillborn or may die within a very short time after birth. A tendency to the development of anencephalus may be familial.

**Cyclops.** In these children the vault of the skull is present, and may appear normal. The hemispheres of the brain are very imperfect, and are united anteriorly. A single eye is usually present, placed in the center of the forehead. The anterior brain area may be cystic. These children usually die very shortly after birth, in well marked cases, but when the deformity is less marked they may live several years. Mentality is completely absent.

**Microcephalus.** The brain may undergo atrophy, or may fail to attain the normal development, and the skull is prematurely ossified. The head may be deformed, and the forehead narrow and sloping, or the small size be the only deformity. Such children are idiotic if the deformity is great. The brain may be merely undeveloped, or it may be variously deformed, or cysts may occupy the area left by the degenerated brain. The premature ossification of the skull was, at one time, considered responsible for the imperfect brain, and craniectomy was performed. This method has been found useless, since the brain itself is abnormal.

**Hypertrophy of the Brain** is a rare abnormality. Two types are recognized. In the first class are found those very large brains, massive and heavy, not to be considered diseased or deformed. These are associated with normal, subnormal, or, very rarely, with excellent mentality. It is necessary to consider this condition before initiating treatment for hydrocephalus.

The second type includes those cases in which great multiplication of the neuroglia cells occurs. This may be local or general, and it affects the gray and white matter about equally. The size of the brain increases, but the nervous elements undergo atrophy. Mentality is lost, various types of cerebral paralysis may occur, and death usually occurs within a few months or a year or two after the onset.

**Oxycephaly** (Pyrgocephaly; Tower head). This is deformity of the skull, characterized by the great height of the frontal and occipital bones. The occipital bone may or may not be included in the deformity. The head thus becomes very tall and rather slender, resembling a tower. The sutures are palpable; the sagittal suture may form a distinct ridge. The cause is not known. Males are more often affected.

Adenoids are common among children so deformed. Visual disturbances are very common, and blindness is not rare, from optic nerve atrophy. It is supposed that the pressure of the carotid artery, which is pushed upward by the deformity, or the abnormal form of the optic foramen, also due to the deformity, may be responsible for the amaurosis.

No treatment is of any avail. These children usually die before or during the years of adolescence.

### SPINA BIFIDA

Spina bifida is not an uncommon deformity. It is due to faulty closure of the spinal canal, from which tumors usually protrude. Several types are recognized. It is often associated with harelip, club foot, cerebral hernia or other deformities.

**Spina bifida occulta** is not associated with tumor formation. The opening left in the spinal arches is very small, and the spinal membranes and spinal fluid do not protrude. Adhesions of the cord to the skin may persist, and this may be associated with imperfect development of the lumbar and sacral spinal centers, and persistent enuresis, paralysis and other nervous disturbances be due to this lack. A dimple or scar-like depression, or an area of hair may be found upon the skin over the defective segment of the canal. Treatment is rarely necessary or useful.

**Meningocele** is a form of spina bifida in which the sac contains meninges and cerebrospinal fluid. It is the mildest form and the least common. The tumor is translucent, usually becomes very large and is usually completely covered with normal skin. The sac may be surgically removed and the pedicle ligated in suitable cases, especially when the tumor is small, no other deformities or paralyses are present, and when compression of the sac is not followed by any unpleasant symptoms. This treatment is useless and dangerous when hydrocephalus co-exists, or when other marked deformities are also present.

**Meningomyelocele** is present as the result of the accumulation of fluid upon the anterior surface of the cord. The tumor then contains the nerve fibers or even part of the cord, as well as meninges and cerebrospinal fluid. It is not completely covered with skin. The cord is usually adherent to the covering at a central area of the thin



membrane covering the part of the tumor left uncovered by skin, and this area of adhesion is called the "central cicatrix". It is often umbilicated. From this cicatrix many fine fibers pass into the spinal canal and downward. Other arrangements of the cord in the tumor are found. Meningomyelocele is usually in the lumbar or sacral region. The tumor usually remains small, but may reach two or three inches in diameter. The cicatrix often presents granulations or ulcerations, and infection is very apt to occur. This membrane is very thin, and if the tumor increases in size to any great extent rupture is inevitable. When this occurs cerebral symptoms are usually marked, and death may occur within a few minutes or hours. If death does not occur, infection is almost inevitable, and this may extend into the meninges and death occur from meningitis. Very rarely the inflammatory processes extend only to the connecting orifice, close this and recovery may be complete. Surgical treatment of meningomyelocele is very difficult and rarely successful, and often is followed by paralysis or by hydrocephalus or both.

**Syringomyelocele** (myelocystocele; hydromyelocele) is the rarest of the spina bifidas. It may be found at any segment of the spinal column. The accumulation of the liquid is in the central canal of the cord. The tumor contains the remnants of the cord, meninges and cerebrospinal fluid. This type may, very rarely, protrude through the intervertebral foramen or anteriorly through the bodies of the vertebrae, forming the tumor within the chest or the abdomen. Syringomyelocele is usually associated with hydrocephalus and may be associated with other deformities. No treatment is of value, and paralyzes usually appear sooner or later. The child is apt to die within a few years, at the best.

**Rachischisis** is the term usually applied to complete failure of the closure of the posterior area of the spinal canal, which is a very rare deformity, but the term is sometimes employed as a synonym of spina bifida.

**Amyelia** is complete absence of the spinal cord. The condition is rare, and life is impossible. Other deformities are commonly associated with amyelia.

**Atelomyelia** is partial deficiency of the cord. Life is usually impossible.

**Heterotopia** of the spinal cord is characterized by the presence of aberrant areas of gray matter scattered among the columns.

**Hydromyelia** is the distension of the cord by the accumulation of cerebrospinal fluid in the central canal.

**Diplomyelia** is the doubling of the cord almost or quite throughout its length.

**Diastematomyelia** is a doubling of the cord at certain areas only.

## NEOPLASMS OF THE CENTRAL NERVOUS SYSTEM

Tumors of the central nervous system are somewhat more common among children than among adults. Primary types are more common than secondary.

**Glioma** is frequently found. This is composed of neuroglial cells and the growth is not sharply limited. It occurs most frequently in the cerebellum, next the pons, but any part of the central nervous system may be the site of glioma; the retina also is occasionally invaded. Glioma is subject to cystic degeneration.

**Sarcoma** is almost as common as glioma. It is usually circumscribed and may be encapsulated. It is most common in the cerebellum, next, in the pons, but it may occur in any part of the nervous system, as in any other part of the body. Any of the types of sarcoma may be present, and while it is usually primary, metastatic sarcoma of the brain is not rare. Sarcoma is subject to cystic degeneration.

**Gliosarcoma** is a tumor in which both neuroglia and connective tissue cells are concerned in the malignant growth.

**Endothelioma** occurs in older children.

**Carcinoma** is very rare during childhood. It is always secondary, when it is found in the central nervous system.

**Tubercles** and **gummata** are also fairly common conditions, causing the symptoms of brain tumor, though these are not properly included among the neoplasms.

**Diagnosis.** It may be very difficult to make the diagnosis. The localization of the tumor may be extremely difficult. Rarely the picture is definite, and the localization easy.

General symptoms of intracranial tumor include several factors, none of which, alone, is pathognomonic. Headache is usually frontal without regard to the location of the tumor. Vomiting is usually present; it bears no relation to dietetic or digestive conditions and may or may not be projectile. Convulsions are very common. At first there may be attacks resembling petit mal, or there may be general convulsions at long intervals. In either case the convulsions become more severe and more frequent as the tumor increases in size. If the tumor invades the motor cortex, the convulsions may be of Jacksonian type. If the tumor occupies a lateral ventricle, the convulsions may be initiated by athetoid movements. Convulsions are more severe when the tumor grows rapidly, and when the meninges are affected.

Choked disc (optic neuritis; papillo-edema) is almost always present. Tumors of the cerebellum, quadrigeminate, occipital lobes and temporal lobes are practically always associated with choked disc.

Mental symptoms are usually present, though these may be delayed until the intracranial pressure becomes great. Fretfulness and irritability may be due to the headache, and these are common in any childhood disease. Dullness, apathy, somnolence, insomnia, and occasionally peculiar attacks of screaming, with or without hallucinations, may appear in turn, or any of these may fail to appear at all. The attacks of screaming usually occur during the night, and these are very hard to control.

Vertigo is almost always present in some degree. It may or may not be associated with the vomiting. It is practically always present in subtentorial tumors.

Bradycardia occurs when the tumor grows very rapidly, or when the intracranial pressure becomes great. It may or may not be a very early symptom. Tachycardia may appear, but is usually transient.

Polyuria is fairly common. Diabetes insipidus almost always appears when the tumor affects the region of the sella turcica, from involvement of the hypophysis.

Enlargement of the head may be due to the tumor growth, but is more often associated with hydrocephalus due to obstruction of the cerebrospinal fluids. This most commonly occurs in the cerebral aqueduct, but either lateral ventricle may be affected.

### Localizing Symptoms

These may be absent, or may be very definite.

**Motor cortex.** Tumors of this region are usually definitely localizable. Spasm, rigidity or convulsions most commonly affect the face, arm or leg on one side of the body. Epileptic attacks of the Jacksonian type may occur. By reference to a chart of the motor cortex the location of the center controlling the affected area is easily found, and the tumor thus localized on the brain of the opposite side from the affected muscles. Paralysis of the muscles affected by the rigidity, spasm or initial movements of the Jacksonian epilepsy follows the complete destruction of these centers or their loss of function due to the pressure of the tumor.

**Frontal lobe.** No localizing symptoms may appear. With the growth of the tumor the motor cortex may be invaded. Tumors upon the left frontal lobe may cause motor aphasia or apraxia. Fretfulness and emotional disturbances are rather common, but these may appear in any one of many diseases.

**Parietal lobe.** Localizing symptoms are not common. Older children may suffer from astereognosis. Involvement of the optic tract may cause hemianopsia. Involvement of the left inferior parietal may cause word blindness.

**Occipital lobe.** When the visual area is involved bilateral hemianopsia is caused. Occasionally vague visual disturbances are noted, without any definitely localized blindness. Areas intermediate between the occipital, parietal, the frontal lobes may cause vague disturbances of perception.

**Temporosphenoidal lobe.** Word deafness is the only localizing symptom.

**Island of Reil.** Lesions of this area show no localizing symptoms. If the motor tract or the speech center is invaded, motor aphasia or spasm, rigidity or paralysis of the muscles controlled by the fibers of the motor tract are affected.

**Crura cerebri.** Tumors affecting the crura are rare. Involvement of the centers of the third nerve and other related centers causes strabismus, usually external; nystagmus; dilation of the pupil and ptosis of the eyelid. Disturbances of the pupillary reflexes vary. If the tumor is large enough to invade the fibers of the crura, crossed paralysis results. Muscular inco-ordination and staggering gait are not uncommon.

Tumors of the velum interpositum increase the intracranial pressure and may cause no definitely localizing symptoms. Athetoid movements, epileptic attacks, mental symptoms, stupor, nocturnal attacks of screaming and various vague and indefinite symptoms may occur.

**Basal ganglia.** Motor symptoms associated with sensory or visual disturbances suggest localization of the tumor in the basal ganglia. Hemiplegia, hemiparesthesia or hemianesthesia associated with dysarthria or olfactory, visual or auditory disturbances may occasionally be found in tumors of this region. Any of the cranial nerves may also be involved. Exact localization is almost never possible.

**Pituitary gland.** Benign pituitary tumors do not usually cause the headache, convulsions, vomiting and other symptoms of intracranial tumors. Malignant tumors may involve the optic nerves on one or both sides, and disturbances of the pituitary secretions may cause various metabolic disturbances, such as Frohlich's syndrome or hypopituitarism (q. v.)

**Cerebellum.** This is the most common site for tumors of the central nervous system. They usually cause the first symptoms after the child begins to walk. If only one hemisphere is involved there may be no symptoms whatever. If the worm or the peduncles are concerned, definite symptoms occur. Vertigo is usually very severe.

**Cerebellar ataxia** causes a staggering, drunken gait, and there is also inco-ordination of all movements, most marked in the voluntary movements. The various involuntary movements may resemble those of chorea, but are much slower. Atony of the muscles of all the limbs, or of the legs only occasionally occurs.



Vomiting, headache, spasms and convulsions may be slight or may be absent.

**Pons.** Crossed paralysis is the chief localizing symptom in pontine tumors, and this is usually present. When the upper pontine centers are concerned, there is usually paralysis of the third and fifth cranial nerves, with ptosis of the eyelid, dilatation of the pupils, external strabismus and corneal ulceration. Facial neuralgia is frequent. These symptoms upon one side are associated with paralysis of the opposite arm and leg. When the lower pontine centers are involved, facial paralysis (omitting the superior division), internal strabismus, contracted pupils, and auditory disturbances are the more common symptoms. Convulsions, headache and vertigo are not commonly noted in pontine tumors.

**Medulla.** Tumors affecting the medulla often cause diabetes mellitus or diabetes insipidus. Involvement of the lower cranial nerves is common, and various irregularities of respiration, pulse, vasomotor control and other visceral symptoms are produced. Thick speech (pudding mouth), dysphagia, loss of control of the tongue in sucking, whistling and speech are common. Hydrocephalus is also a common result of medullary tumor.

**Spinal cord.** Tumors of the spinal cord present symptoms not to be distinguished from those of transverse myelitis.

The most common tumors of the cord are sarcoma, fibroma, lipoma or osteoma, arising from the membranes of the cord or the vertebrae. Glioma and sarcoma may arise from the cord itself. Tumors of the cord are apt to be diffuse, and diagnosis is difficult.

There may be pain first; this affects arms, body or legs, according to the level of the affected segments. Girdle pain is common. Hyperesthesia of certain areas may be followed by anesthesia.

Paralysis of the muscles may be of the lower neuron type at the level of the tumor, and of the upper neuron type below the injury. Paralysis of the leg on one side, with a zone of hyperesthesia, may be associated with a zone of anesthesia on the opposite side (Brown-Sequard paralysis). Paralysis of the arms is rare. If the tumor is in the lumbar region, the rectum and bladder may become paralyzed.

**Diagnosis.** The symptoms described suggest the diagnosis. Stereoscopic X-ray plates of the skull may show a shadow, if the tumor is full of blood, or may show evidences of bone involvement. Tumors which affect the sella turcica usually show in X-ray plates, especially in the stereoscopic examination.

Uranalysis may show polyuria or glycosuria, and these suggest brain tumor, in the absence of other etiological factors for these urinary changes. Comparison of the phosphates in the food with those of the urine occasionally suggest destruction of the brain

tissue; this finding is important if present, but the absence of the disproportion between ingested and excreted phosphates is of no significance in diagnosis.

Blood examinations may show lymphocytosis, disturbances of fibrin formation and fibrinolysis, concentration, and hyperglycemia.

The differential diagnosis of the different types of tumor is usually difficult or impossible. Solitary tubercle can be eliminated when no other evidences of tuberculousis can be found, after very careful examination. Gumma can be eliminated if no other syphilitic symptoms can be found. Encephalitis, hydrocephalus from other causes, cerebral abscess, and meningitis must be considered in the differential diagnosis.

**Treatment** of neoplasms within the central nervous system is difficult. General treatment for maintaining the best possible structural relations often relieves the symptoms. If the tumor can be located the surgical possibilities should be considered. It must be remembered that the prognosis is hopeless unless the tumor can be removed. For gumma the treatment is that of syphilis. For tubercle the treatment of tuberculosis is indicated.

Tumors upon the cortex may often be removed successfully, and the child show no later ill effects. Tumors at the base of the brain are occasionally operable. Tumors of the cerebellum can often be removed, and recovery be complete. Tumors of the internal capsule, basal ganglia, crura, pons and medulla are not operable.

**Prognosis.** Without operation, the prognosis is hopeless. The tumor increases in size steadily, causing various symptoms, and death is inevitable. Life may persist for a few months or, rarely, a few years after the first symptoms. Malignant tumors cause speedy death with few pressure symptoms. Tumors of the cord often cause bed sores and infection of the urinary tract. Coma or stupor usually precedes death by some days or hours.

## CHAPTER LXVI

### THE PSYCHONEUROSES

In several diseases of childhood the state of consciousness, emotional conditions, improper training and shocking experiences are factors in etiology, and conscious states are important factors in symptomatology. Because of the place of mental factors in these diseases, they may be classed as psychoneuroses. It must be understood that this term has no relation whatever to insanity, though some of these conditions may initiate some form of insanity.

### NERVOUSNESS IN CHILDREN

The "nervous diathesis" has been discussed with other diatheses, in the section of Constitutional Diseases. The symptoms associated with nervousness, such as those of hysteria, neurasthenia, headache, sleep disturbances and imperfect self-control, are mentioned in the special conditions with which they are commonly associated. There is, however, a certain state in which no actual disease is present, but which predisposes to these and which tends to interfere with the normal mental and physical development of the child.

**Etiology.** Inherited tendency is nearly always to be found. The mother or the father or both may be nervous, or there may be a family tendency to nervousness on one or both sides. If both mother and father are nervous the child is almost invariably so. Not only heredity but also imitation and the evil effects produced upon the child by the nervousness of those with whom he is associated are concerned in this relationship.

The children of parents who are too old, or who are subject to wasting diseases, as tuberculosis, or who are alcoholic or are affected by excessive dissipation, hard work, long hours or semi-starvation are very apt to be nervous, though there may not be any truly hereditary influence to be found.

Babies may be improperly trained. They are too often awakened to be shown to visitors, they may be played with to excess, or pampered too much, or allowed to cry for too long a time. The mother may suddenly determine to make him sleep alone and allow him to cry for hours, or he may be older, and be injured by fear, when he is suddenly removed to a room alone. All these things exert a harmful effect upon the brain of the child and thus tend to make him nervous in later life.

Children who have been subject to diseases of malnutrition during infancy are often nervous. The condition then passes away with increased vitality. If the period of marasmus is too greatly prolonged, the nervous system may never regain its normal activity.

In school nervousness is often caused by the long hours, the hard study, the nervousness of a teacher, the fact of being closely associated with many other children in over-crowded rooms, the tendency to neglect certain natural impulses with the resulting constipation and the modification of meals usually required by school life are all important factors in causing nervousness.

Ill health may cause temporary nervousness, and this should be considered in the training of children. The healthy child who has missed a meal may not be consciously hungry but he is nervous and irritable. A bad cold, a little feverishness, and digestive disturbance and especially constipation are very common causes of temporary nervousness. Grave injustice may be done to such a child when efforts at training are injudiciously severe.

Shock, trauma, disappointment and grief are much more apt to cause nervousness in children than in adults. Nervousness may persist for days after a fall, the loss of a toy or anything which causes him to feel a sense of injustice.

Hyperopia and astigmatism are occasional causes. Tubercular children are often nervous.

Perhaps there is no more potent cause of nervousness, occurring after birth, than the lesions of the occiput and the upper cervical vertebra. Such lesions cause the most marked nervousness in adults, and the developing brain of the child is even more severely affected.

Occipital and cervical lesions are caused in many ways. Most commonly careless handling of the child before the head can be held steadily is the cause. The child may have too high a pillow, or he may lie with the head in an awkward position, especially when he is held in the lap while sleeping or when he sleeps in his carriage while it bumps over a rough path.

**Symptoms** of nervousness are many. Babies become restless during the night and awake crying. Babies vomit the food, especially if it is given in a new bottle, or if the mother wears a different dress when she is nursing the baby or if she sits in a different room. Babies and older children may refuse to eat (anorexia nervosa) if the food has a different flavor or color or if any new article is presented.

Nervous children are apt to start and perhaps to cry upon a slight noise, dimness of light, increased light or any sudden movement on the part of older people.

Nervous children are often precocious in some one direction. Babies become shy and timid, and older children painfully bashful. They laugh and cry upon slight provocation, or may laugh and cry only upon considerable provocation and then weep long and loudly or laugh until a hysterical condition is produced.



Children of school age who are nervous may present something of the same symptoms as those found in babies and little children, and they suffer from other symptoms also. They tire easily, suffer from alternating diarrhea and constipation or from either alone, they are extremely emotional and impressionable and have remarkable power of imagination. If they have not been correctly trained this imaginability may be repressed and the child suffers grave fears of the creatures of his own imagination. If an ignorant nurse frightens such a child with tales of monsters, he suffers from fears which are not to be removed unless he confides in some older person. Being shy, he rarely does this.

Any slight reproof or the teasing of his playmates may cause marked increase in the nervous tendencies.

Peculiarities of habit may develop and chorea may be suspected. The grimaces may be conspicuous. Such children are apt to develop tics and impelled actions, and they are more apt to have chorea than are normal children.

Physical symptoms are fairly constant. These children are thin, anemic, constipated, diarrheic, tend to nausea on riding in a boat or train, upon excitement or without any recognizable cause. They are usually hyperopic and astigmatism is common. Thigh-friction and other forms of masturbation are very common; this is a result rather than a cause of the nervousness.

Headache is very common, especially among those who are hyperopic and astigmatic.

**Treatment** is difficult and prolonged but is ultimately very satisfactory. The correction of the inevitable lesions of the occiput and the upper cervical vertebra often gives immediate and marked relief. After the corrections have been completed they are apt to recur, until the nervous tendency is overcome.

Little babies must be given twenty-three hours of sleep. The food should be investigated. Any tendency to constipation must be overcome by the usual methods. If the mother is nervous a nurse must be provided, if this is in any way possible. Excess of light, too little light, excessive noise, older people walking around and producing confusion are factors which tend to nervousness in babies and these must be eliminated.

Children of run-about age require eighteen hours of sleep. Any attempt to encourage precocity must immediately be terminated. If the child sleeps poorly the condition of the bed should be investigated. Too soft or too hard a bed, too much or too little covering, too little fresh air or too strong a draft and the presence of older persons in too close proximity are errors which must be eliminated when they are found.

Regular meals are of extreme importance. Three or five meals may be given each day, but they must be regular and properly balanced.

Fresh air and sunshine are good for all children and are almost essential to the recovery of a nervous child. Change of scene may be good, especially from a high level to the ocean, or from the sea level to the mountains. Country life is greatly to be desired if the houses are properly ventilated and sanitation beyond reproach.

The question of school is important. The child must not be over-worked in school nor must he worry about his standing. Yet he must receive education and he must associate with other children. So long as no definite nervous disease is present, but only the nervous tendency, he may usually remain in school. If there are too rigid requirements he may be sent to another, less advanced class in another school. (It is not often permissible to demote a bright, ambitious child unless there is a complete change of associations). Home instruction, with a teacher, is useful for a few months, but is rarely desirable.

Play and games are greatly to be encouraged. He should engage in all games out of doors which are suitable to his age and physical condition.

If a child fears the darkness he should be given a faint light in his room at night. If he fears being alone, some older person may sleep in the room if it is large and well ventilated. Sometimes a doll or toy relieves the loneliness as well as a person. Compulsion is always bad for the nervous child who is afraid. With better nutrition the nervous system becomes normal and the fears pass away.

Discipline is difficult. Nothing which shocks or humiliates the nervous child is harmless, and yet he must be trained to self-control and obedience. With tact and thoughtfulness it is usually possible to train the nervous child without causing any harm. It must be remembered that he is less able to control himself than are normal children, and perfection is not to be expected, even of them.

**Prognosis.** With proper treatment, especially the correction of the lesions mentioned, recovery is to be expected. Improvement is always gradual. Inherited structural conditions are not to be overcome, but the child's nervous system may be so developed as to function normally during his entire lifetime.

## NEURASTHENIA

The symptoms of neurasthenia are not easily distinguished from those of nervousness in general, in some cases.

**Etiology.** In typical cases, the child, already somewhat neuro-pathic, suffers from over-work in school, especially when this is

associated with music lessons, art lessons, dancing lessons and the like; excessive emotional strain along religious lines, over-excitement in entertainment, as that due to indulgence in movies or theaters, unhygienic living and improper diets.

The spinal column and the thorax are always extremely rigid.

**The symptoms** vary. The child is usually pale, anemic, constipated, irritable and excitable. Diarrhea may alternate with constipation. There are usually shadows under the eyes and around the mouth and nose. The child complains of fatigue upon the least exertion, and he does not take part in games, even, on account of weariness. Insomnia is a great burden, and it is usually less severe than the child supposes.

The reflexes are usually increased, the eyelids and hands tremble, the pupils are often unequal and there is a tendency to stammering in speech.

Mentality is not directly affected, but the child is usually unable to apply himself attentively to his studies and thus seems inattentive, listless, disobedient and lazy.

**Treatment** is that of nervousness in general, plus greatly increased rest. The rigidity of the spinal column and the thorax perpetuates the condition and these must be brought to normal flexibility. This alone results in recovery in mild cases.

Severe cases require rest in bed for several weeks, with milk diet and absolutely no excitement or any demands upon his attention or strength. A good nurse is essential to the success of the treatment. A neurotic mother must not be permitted to nurse the child, if this can in any way be avoided. When this long rest permits the child to feel stronger and he begins to wish to get up, he must be very gradually permitted to sit up in bed a few minutes, the next day a little longer time, and so on. Then he may stand upon his feet for a minute or so, then for a longer time; then he may walk to a chair near the bed, then to a chair a few steps further away. Always, his wish to exert himself must genuinely precede his being permitted to do so, and he must be held back from exertion as long as this can be done without causing fretfulness.

During this rest, a modified milk diet is desirable. He should have a glass of water and then a glass of orange juice or some other fruit juice first in the morning. About three hours later, after the morning toilet has been completed and he is rested from that, he may have a half glass of milk or a glass of milk. Every half hour during the day, until three o'clock, he is to have either a glass of milk or a glass of water; the general condition of the child must enable the doctor to decide how many glasses of milk and how many of water the child must receive each day; and the nurse must see that these directions are carried out in full. He rests after three

o'clock until six o'clock, when he has dinner. This meal should include the juices of raw vegetables, about two ounces, and this may be added to soup, after the soup has been slightly cooled, or it may be taken diluted in cold water or in water which is comfortably hot. The vegetable juices must not be brought to a temperature above 180° F. The juices of lettuce, celery, onions, beets, carrots, cabbage, chard, endive, and any other colored vegetables may be used. Tomato juice, either raw or canned, can be given also; tomato juice may be boiled without losing all of its good qualities.

This meal may include, also, not more than two of the following: soft boiled egg, baked apple, prunes which have been soaked until soft but not cooked, cocoa, any of the subacid raw or cooked fruits, such as peaches, apples, or dried fruits, toast or cereal (but not both), ice-cream eaten very slowly, or any other of the foods usually given to a child two years old. Meats are best omitted altogether.

As he improves in digestion and begins to gain in weight, he may have a very small amount of chicken or fish two or three times each week. His diet list may be gradually extended until he is taking the food normal for a child of his age and weight.

Massage and hydrotherapy are to be used throughout the disease, but no treatment, other than the correction of the bony lesions, should be given if it seems to cause the child any pain or if it magnifies the symptoms.

With convalescence a change of scene is very desirable. This may be secured by a change from city to country, or from country to city, or even from one room to another which has been newly refurnished and stocked with a few (a very few) new toys. If it is possible for him to be taken from a high altitude to the seashore, or from a low altitude to the mountains, his recovery is greatly facilitated.

Combatting the depression may be difficult. Sometimes he can be cheered up by ordinary methods; sometimes his depression may be exaggerated humorously, until he sees the absurdity of his viewpoint. Various methods are required by different children, and by the same child at different times. A tactful nurse, accustomed to sick children, can usually meet this condition successfully.

With improvement, there is danger of excessive exertion. This is apt to terminate in relapse, and is to be urgently avoided.

After the child seems perfectly well, he should be brought for thorough examination once each month for a year, then once or twice each year until after he has completed the puberty changes. The first appearance of spinal rigidity or increased reflexes should receive immediate and adequate attention.

**Prognosis.** With correct treatment, the child should be ready for school in a year from the onset. He is apt to be nervous until after puberty.



## HYSTERIA

This is a disease of the nervous system characterized by subnormal activity of the cortical centers, whereby the patient becomes abnormally susceptible to emotional and suggestive influences.

**Etiology.** Subnormal stability of the cortical neurons is usually hereditary. The ancestors of such a child may be neurotic, hysterical, epileptic, feeble-minded, of unusually brilliant mentality or merely "peculiar". The parents may be too old, too young, alcoholic, hysterical or merely unhappily situated. The mother may have been over-worked during her pregnancy with the child who is hysterical, or may have been poorly nourished or the subject of pelvic disease of any kind, or of the lower thoracic or lumbar lesions so often responsible for the defective development of the embryo and fetus.

After birth many causes of mental and nervous instability may be found. Malnutrition of any kind during infancy or childhood; the acute infectious diseases, in which the temperature may reach an extreme degree or in which the meninges may be somewhat inflamed; toxemia at any time previous to the attack of hysteria; an excessive heat or cold and improper clothing are very common factors which may lead to incorrect nervous development. Nervous parents or nervous nurses lead to imitation of nervous habits.

Children who are punished improperly, who are kept in a state of constant unhappiness and who are subject to the whims of older children are all apt to become hysterical. Children who are too much pampered and who are not taught self-control or obedience are, perhaps, even more often subject to hysteria than are children who are abused.

Even children of neurotic parents are apt to avoid hysteria if they receive proper training during the first five years of life.

Given unstable neurons of the cortex, the child is apt to contract hysteria as a result of any shock or strong suggestion.

Fright, constant fear, grief, disappointment or emotional strain may be followed by hysteria, and the cause is then usually recognizable by the parents. Shocking occurrences during early childhood may cause an unstable condition of certain nerve centers which persists during an entire lifetime, unrecognized. These may initiate activity of other centers, and thus cause hysteria. The Freudian complexes, based upon sexual or some related emotional state, are probably rare. Religious experiences are common causes of hysteria in this country. (Religious emotions are included with the sexual by Freud). Religious hysteria may be associated with the appearance of congested, reddish areas upon the soles and palms in hysterical children, usually girls, who are approaching puberty. The origin of the location of these areas is apparent.

The place of shocking experiences as a cause of hysteria is illustrated by the case of a boy of eight who saw a dog run over by a street-car. The stomach and intestines of the dog, writhing after the abdomen was cut open, presented a shocking sight to the child. The stomach of the dog was cut open, and the partly digested bread and meat pressed out. That child was unable to eat for several days (hysterical anorexia). When he was compelled to eat, vomiting occurred immediately. The child happened to be a member of an educated family, and the nervous nature of the condition was recognized. Careful questioning elicited the origin of the neurosis and after some further treatment the child recovered.

**Pathology.** In many cases no underlying organic state can be found on the most careful examination. In most cases, however, minute changes can be found in the brain of a hysterical subject if many slides are prepared.

On gross examination, small areas of gray matter may be found scattered among the fibers of the internal or the external capsule. The convolutions are less regular than normal, often being flattened and broad, or narrow and sharply rounded.

Microscopic examination shows the peripheral gray matter somewhat diminished. The nuclei are more abundant than in normal brain, and there is much less of the intercellular granular gray matter. The cells present rather an undeveloped appearance, considering the age of the child, and among these cells are others which appear sufficiently developed but which are not quite normal in form or dendritic branchings. The cortex of the frontal lobes and the anterior parts of the parietal lobes usually show these changes most, but any area of the brain may present abnormalities.

**Symptoms** vary considerably. They include sensory, motor, vasomotor, circulatory, respiratory and visceral phenomena. Symptoms are almost invariably due to the influence of some suggestion.

Reaction to suggestion is normal so long as the effects are, in general, for the good of the individual. The normal child imitates the habits of other members of the family, and thus learns the customs of the family. Normal children react to the suggestions given them in school, and become trained according to the wishes of the teacher, if she is skillful and the child normal.

Reaction to suggestions in a way which interferes with normal health is almost invariably due to the instability of the nerve centers of the cortex which is the essential factor in hysteria.

Abnormal reaction may be either positive or negative. Abnormal positive reactions are those due to an exaggerated acceptance of the views of others, of the effects of things seen or heard or of the unbased conclusions of the abnormal child. The nervous child overhears an older person express dislike of himself. Without considering the people who do like him, he may conclude that he is worthless, bad, untruthful, and so on, and immediately may begin to make himself what he has been called. If he overhears himself called obedient, truthful and kind, he tends to become obedient, truthful and kind, for the time. This tendency on the part of normal children is employed in their training.

The normal child, hearing himself called worthless, considers that his parents, friends or others whom he likes do not hold that

view, and he is not adversely affected, though he may dislike the one who dislikes him, and he may be hurt for a time.

Negative reaction to suggestion is especially common among children. For example, a girl of twelve years overheard the statement that the vomiting of coffee-grounds indicated cancer, and that no child could have cancer. She began to vomit occasionally the next day, and swallowed coffee-grounds in order that she might vomit them later.

Sensory disturbances include many types; headache, neuralgic pains located almost anywhere in the body. Pain with contracture around joints is a common manifestation. Anesthetic areas are probably always to be found upon thorough examination of a hysterical patient of any age. Hyperesthesia is less common among children than adults. Feelings of coldness, deadness, warmth, quiverings, prickling and the sensation of an electric shock are very common sensory disturbances. If the child has overheard any peculiar sensations as being diagnostic of some disease, especially some rare and terrible disease, these sensations most commonly occur. It is not to be supposed that these are, therefore, imagined sensations or the result of conscious deception on the part of the child; such symptoms are as real to the patient as are the visceral and circulatory symptoms of hysteria.

Blindness and deafness are less common in children than in adults. The fields of color vision may not be contracted in little children, but are usually contracted in children nearing puberty. The red-green field is contracted unevenly, so that in some meridians the blue-yellow field is larger than the red-green. This is pathognomic of hysteria, when brain tumor has been eliminated. Photophobia, asthenopia, blepharospasm and paralysis of the ocular muscles are all fairly common symptoms among hysterical children.

Globus hystericus, or the sensation of a lump in the throat, is commonly present.

Visceral symptoms include those left over from illnesses, those observed or heard of during the illnesses of others, and symptoms not due to any initial experience that the members of the family can remember.

Respiratory symptoms include hyperpnea, dyspnea, sighing, yawning, and hiccough. Hysterical cough is commonly laryngeal, but may be deep and very hollow. Aphasia is due to hysterical paralysis of the laryngeal muscles, and is usually associated with respiratory symptoms. Asthmatic symptoms are not common, but may occur.

Circulatory symptoms are less common. Edema of any area of the body is not rare. The face may be edematous on one or both sides. The eyelids are often edematous. The hands are often swollen and the symptoms of Raynaud's disease are not uncommon.

Tachycardia is more common than bradycardia. The pulse may be irregular. The blood pressure varies remarkably, especially if conversation, adapted to different emotional states, is carried on within the hearing of the child. The reaction is usually more pronounced if the conversation occurs in another room, but definitely within hearing.

Local vasodilation and local bleedings are not common but do occur. Self-inflicted injuries are to be suspected in these cases.

Rise of temperature is common, and is occasionally actually present. In nearly all cases of very high temperature in hysteria the child sent the mercury up by the use of hot water bottle or some other warm article. Rarely the fever is the sole manifestation of hysteria. Afternoon rise of temperature may suggest tuberculosis.

Temperatures of 112 to 120° F. have been reported. These cases are undoubtedly all fraudulent.

Unilateral rise of temperature has been reported, apparently without the possibility of deception.

Meningitis is frequently simulated, even by children who have never heard of cases of meningitis. Fever to 102.5° F. may occur, and the retraction of the head, contracted pupils, cerebral vomiting and paralytic symptoms make the diagnosis almost definitely of meningitis. The disease may persist as long as the real meningitis, yet recovery be complete and speedy when improvement begins. Recovery may be too sudden to be true, or some other peculiar event may indicate the correct diagnosis of hysteria.

Pain in the region of the appendix, with moderate fever, may simulate appendicitis. The blood count should immediately indicate the absence of any inflammatory process in the body.

Digestive symptoms include vomiting, constipation, anorexia, and meteorism. Diarrhea is rarely hysterical, but it may be very persistent. Spasm of the esophagus may be so severe as to prevent swallowing altogether. Sounds may be passed without difficulty if the patient is anesthetized, and he may be able to swallow without difficulty afterward. Usually the passage of a sound during anesthesia has no beneficent effects. Gastralgia is fairly common in children with other digestive symptoms of hysteria. Incontinence of feces and anal prolapse have been considered hysterical in some children with other hysterical symptoms.

Hysterical vomiting may occur during infancy, even before the end of the first year. This is usually due to an attempt to give the baby new food or food without sugar. The baby may thus have such an aversion to food that he refuses it completely. By offering him food from another type of nipple, after he has become hungry, the condition is usually overcome.



Masturbation is rather common among hysterical children. It seems probable that this is a symptom rather than a cause, of the hysteria. Enuresis, polliakiuria, ischuria, paralysis of the bladder and incontinence of urine are occasionally found.

Motor phenomena present protean forms. Spasms resembling epilepsy are fairly common. The series of events described by Charcot, including several stages of hysterical phenomena are rare in this country and are very rarely found in children. After the ages of twelve such convulsions, including the passionate and dramatic phases, have been found. The hysterical convulsions usually include opisthotonos and are very violent. Almost never does the child hurt herself, bite her tongue, void urine or feces or pass into complete unconsciousness. In some cases it is difficult to distinguish between hysterical convulsions and true epilepsy. The attack is followed by complete recovery, with no marked fatigue. Catalepsy is common among children, and often follows the hysterical convulsion for a short time or for several hours, after hysterical convulsions. It passes into natural sleep if the child is kept quiet in a dark, cool room. This phenomenon resembles the stupor following an attack of true epilepsy.

Paralysis may greatly resemble that due to organic brain or cord disease. One limb, part of a limb, a few fingers, the entire body below the neck, one side of the body, both legs or both arms may show spastic or flaccid paralysis. The tendon reflexes are usually normal or increased. Electrical reactions of the paralyzed muscles are normal. Tremor is rare in children. Ankle clonus and Babinski reflex are absent.

Astasia-abasia is common among hysterical children. The child has complete control of the legs while he is in bed or lies down during the day. Not only direct control, but also co-ordination, are normal in every way. But when he rises, he is unable to stand alone or to walk. In mild cases he can stand and walk with assistance, but he may be unable to stand even with help, unless he is completely supported.

Physical symptoms may initiate the epileptic equivalent. The child may have an attack of hallucination and delusions, paroxysms of laughter, delirium, weeping, anger, mania and fear, and from these he recovers immediately and completely. He may be unreasonable, jealous, irritable, excitable, gentle, furious, cruel, stupid, brilliant, egotistical and humble in turn, at intervals of hours or weeks. Night terrors and somnambulism are frequent in these, as in other nervous children.

These states pass by degrees into insanity, and the hysterical child may be also insane or mentally defective, or insanity or mental deterioration may follow hysterical symptoms. Probably in such

cases there has been an organic cause for the hysterical symptoms from the first.

**Diagnosis.** No noninfectious disease fails to be sometimes imitated by hysterical symptoms. Nearly always some symptoms bear such a relation to the others as to prove the impossibility of their being due to organic disease. Nevertheless, certain organic diseases are associated with hysterical symptoms, and the hysterical child may suffer from organic diseases.

Very rarely a group of symptoms is definitely hysterical, and the diagnosis is evident. More commonly there is an apparent possibility of some organic disease associated with hysteria, and therefore the diagnosis of hysteria alone becomes very difficult. For it is evident that the diagnosis of hysteria does not eliminate organic disease.

Epilepsy is eliminated by the fact that the epileptic fit does often cause injury, and the epileptic psychology is very different from the hysterical psychology. The long stupor and sleep after an epileptic attack may indicate the diagnosis.

Hysterical contractures are more rigid than are organic contractures, and the hysterical type usually disappears with anesthesia.

Muscles which are paralyzed by brain lesions, cord lesions or nerve lesions, spasmophilia, tetany and other abnormal muscular conditions usually have a definite electrical reaction. Hysterical paralysis is associated with normal electrical reactions, though the excitability of the muscle may be somewhat increased.

Reflexes are normal during anesthesia in hysteria. This is not usually true in paralysis due to organic lesions.

Hysterical chorea is more irregular and more violent than is true chorea, and the limbs are hypertonic rather than atonic, as they are in true chorea.

Sensory disturbances do not follow the distribution of sensory nerves, but do present some resemblance to the representation of the affected areas upon the sensory cerebral cortex.

Hysterical joints appear suddenly, are usually painful, and present no evidences of acute inflammatory states.

Hysterical headache usually appears when its presence saves the child from some unpleasant experience, and disappears when some pleasant event seems probable. It must be remembered that this is true, to some extent, of symptoms due to definite organic disease.

Cough, dyspnea, vomiting, sighing and hiccough are nearly always associated with some organic disease or some persistent habit, when they are not hysterical. Hysterical attacks of these symptoms are almost always associated with other hysterical phenomena. Hysterical anorexia and some cases of hysterical vomiting are due to

an attempt to compel the child to eat what he does not wish to eat, and the mother usually remembers that occurrence.

The normal findings after an examination of the urine, feces, vomitus, sputum and the reflexes usually determines the hysterical nature of the attack. The blood shows rather a tendency to the embryonic types, but is otherwise normal.

The recognition of the hysterical elements is of great importance. Quiet and persistent questioning may show the origin of the hysteria. The child should be questioned as to his feeling when the attack seems imminent; what these feelings make him think about; what he ever experienced before like these feelings; what he likes and what he dislikes in the way of lessons, games, colors, music, food, places to live, and so on. Dreams may be used in the same manner, merely as points from which questions may extend. No attempt at definite psychoanalysis should be made by an inexperienced person, but in some cases, in older children, it may be necessary to secure the services of a psychoanalyst.

When the primary factor is recognized by the child, he may be brought to realize the absurdity of being affected by it.

Another line of investigation is found in his desires. He should be led to talk freely upon his ambitions, and the fact that his symptoms prevent his attaining that ambition must be kept before him. In some children there is a sort of concealment. The child is unable to attain his ambition to excel, say in some game, and he becomes ill as the result; not that he is disappointed to so great an extent, but that this "saves his face" to himself; he could not expect to excel, being paralyzed or otherwise disabled, but he accomplished much under the circumstances of his illness. This attitude is not voluntary and is usually unconscious, but when his attention is brought to the fact in a kindly manner he is usually able to realize his wrong viewpoint and decide upon some wiser manner of meeting the situation.

**Treatment** includes, first, the treatment given for nervous children. This must include especial attention to the vertebral lesions of the cervical and the lumbar regions.

Prophylaxis includes the maintenance of correct structural relation of the entire body, and proper training and education of children. Not only during childhood, but also during the entire life of the individual, correct training of children is important. The adult who had normal childhood never does become hysterical.

The child with neurotic inheritance should receive especially careful training. He should also live out of doors and, in general, receive the care advised for nervous children. In this way his nervous system may finally attain normal, or practically normal, development and hysteria be prevented.

When symptoms are found to be hysterical, the treatment must be devoted to the removal of the symptoms and of the instability which has permitted their initiation. The first important thing is to remove the child from the influence of other nervous people. The mother is almost invariably neurotic or unwisely sympathetic. She may find it hard to believe that her influence perpetuates the neurosis of the child, but she must realize that unless she is willing to allow the child to receive proper care the prospect is very gloomy for his recovery.

The child should be kept under observation, without his knowledge, as long as he is under treatment. He may be placed in a room alone, or he may be in a ward or room with other children, according to the nature of his symptoms. The hysterical anger may require isolation from other children, or even from adults. Rewards are of great value, when he does not cry all day, or when he moves one finger of the paralyzed hand, or when he retains his food until the next meal, if he has had hysterical vomiting, then he may walk among the flowers, or he may have a visitor whom he greatly desires, or he may have some article which he likes especially well.

Punishments are to be avoided completely. Treatment may, if necessary, be uncomfortable, but they should definitely be treatments, and no punishments. If he vomits his food, he may need to remain in bed, or to have the stomach washed out, or to return to an old, disliked diet. But these methods must never be punishments, and they must always have a beneficial effect upon him, regardless of the educational results.

Changes of surroundings, as from a room with one outlook to another with a different outlook, if he enjoys looking out the windows, or change from the sea level to the mountains, or from a high altitude to the seashore, or from country to city or vice versa, may be the starting point of speedy recovery.

Diversions may be employed as rewards, or they may be an important part of the treatment. The child who is subject to brooding may require diversion all day; the child who seems to enjoy impressing others by the peculiarities of his symptoms may improve more rapidly when he is left alone.

During the days when an effort is being made to secure his co-operation, to determine the source of his disorder or to enable him to wish to be well, no diversions are to be given. But the diversion may be given him after he has shown some tendency to improvement, whether mental or physical.

Aside from the educational methods, his body must be built up. These children are usually underweight, and they must be brought to normal weight. They may be very much overweight, and this is usually due to improper diet or to some disturbance of the internal



secretions. In either case the condition should be remedied as quickly as is possible.

Massage is very useful. The masseuse must understand the need for care in her conversation. If she talks in a gloomy way, or if her talk bears an adverse relation to the affliction from which the child suffers, great harm may be caused and recovery greatly delayed. The nurse should remain in the room during the massage if there is any doubt as to the tactfulness of the masseuse. In one case a child ten years old, with hysteria due to a sexual complex, was given massage by a very skillful masseuse, but who gossiped during the entire time of the massage with the child's nurse about family skeletons, divorces, illegal relations and other subjects. It is not surprising that the massage gave harm to the patient and no good.

In certain cases a sharp command is followed by immediate activity of the paralyzed muscles, cessation of the abnormal movements or of the hysterical fit or attack of anger. The particular symptoms may not recur, but, unless definite measures for the relief of the unstable cortical centers are provided, other and usually more serious hysterical symptoms are very apt to follow.

To give a definite time for recovery, as, for example, "You will walk easily on November third at eleven o'clock in the morning" and repeating this daily until the time has come, has many advocates. Its danger lies in the possibility that the child is not able to walk easily at the time set, when he loses confidence in the person who gave the promise. Some children react negatively to suggestion, and such a child is almost sure to find himself very much worse at the definite time set.

This negative reaction can be employed in treatment. Such a child may be told that he cannot move a finger, that you bet five cents he cannot move that finger, that you will give five cents if he will move that finger because you feel sure he cannot, and so on. In those cases with negative reaction, he is very apt to move the finger, in order to prove you wrong. In such a case, the physician's delight must be very evident; the child must be pleased with the result of his reaction.

In other cases, when treatment is given, the child is told that it will do him much good, and the definite good to be accomplished may be told him if that good is certain to follow the treatment, not otherwise. If he is negatively minded, he may be told that the treatment may not do any good; you are sorry; you do the best you can; but it is doubtful whether any good will follow or not. You hoped that he could move his finger, but think he too weak yet, and so on. He is very apt to move that finger, just to show you he can.

Every child presents his own problems and his condition outlines his treatment, if it is properly understood.

**Prognosis.** The hysterical symptoms usually disappear, with correct treatment, within a few days or weeks. The unstable nervous system may remain throughout life, despite the most careful treatment, or it may become developed normally within a few months or a year. If the stability of the nervous system can be secured, no further hysterical symptoms appear.

## CHAPTER LXVII

### CONGENITAL MENTAL DEFECTIVES

The condition of the brain at birth may be so far from normal that the child never does, and never can, attain normal mentality.

A baby which shows marked defect at birth is almost always of imperfect mentality during its lifetime, which is usually short. The gross brain defects are never compatible with the development of any recognizable mental activity. Such activity as they show is that due to reflex action, sometimes quite complicated, which is mediated by such nerve centers as are sufficiently well developed to enable them to perform the simple function of co-ordination.

The milder grades of cerebral defect may be associated with slight mental peculiarities.

In many cases, marked mental defect may be associated with no recognizable cerebral defect whatever.

#### TYPES

**Idiots** always show marked physical signs of defect. They may be taught to say a few words, but never to express definite ideas in language. The mental state never reaches more than that of a normal two year old child, at best. Absolute idiots are those who never display any indication of mentality whatever.

**Imbeciles** are those who can be taught to talk fairly well, and the highest grades may be taught to write a few words. They are never able to express ideas in writing. The mentality never reaches a grade higher than that of a normal child of about seven years.

**Morons** and the feebleminded may be taught to write fairly well, but their mentality is definitely below normal throughout life. Feeble minded children can never become self-supporting. The higher grade moron may attain ability to support himself, and they are, unfortunately, apt to marry and have children.

**Moral idiots** have fairly normal mentality, but are unable to govern themselves morally. Moral imbeciles and moral morons make up a very large proportion of adult criminals. A very great mental ability may be shown by these individuals in the pursuit of their antisocial aims, but they seem unable to make an honest living. Little normal children often display antisocial proclivities, but they outgrow these tendencies. The moral imbecile never does outgrow the immature unmoral state.

**Diagnosis** of the markedly defective children is easy. For the milder grades, especially during the first few years of childhood, it

may be difficult to distinguish between children who are merely very backward and those in whom the brain is imperfectly developed. Races for whom high intellectual development is impossible usually show more rapid mental development during the first few years of life than do those for whom the greater attainments are ultimately possible. Children whose mental development is delayed even beyond the normal for those of their race and family may become as highly intellectual as any of the family and may even exceed them, when adult life is reached. It is very necessary that no confusion be permitted in the diagnosis between the delayed, but ultimately normal development, and the defective and permanently defective development.

The normal child may show evidences of conscious pleasure at the hearing of pleasant voices or sounds at the second month, and may delight in things seen within two weeks or so later; other normal children may not show evidences of conscious delight until a month or so later. Speech is especially of irregular attainment. Such skill in talking as the normal child of one year may sometimes attain, other normal children of four years may not possess. Both these children may be of equal attainments in school at the age of six, and may never show any mental inequality.

Unwise training, especially the use of "baby-talk", may be in part responsible for this inequality, but delayed speech is not always due to this factor. The history of illness or lack of care during early infancy may be responsible for delayed development, and this may or may not interfere with the possibility of an ultimately normal intelligence.

**Treatment** of these defective children is usually limited to educational and protective measures. If any structural conditions, such as adenoids, require surgical intervention, this should be given as to normal children. But it must not be expected that this will exert any great effect upon the mental condition, and no surgical methods can be considered in any way therapeutic for mental defectives.

Lesions of the cervical vertebra are almost invariably present. Correction of these may improve the condition slightly, but the lesions constantly recur. No marked improvement can be expected.

Institutional life is usually indicated for idiots of higher grade and for imbeciles, if the institution is well managed. The education of these children requires teachers of great skill and special training. It is not usually possible to provide such teachers at home. Parents often feel that it is selfish for them to send a defective child away from home, but if there are other children in the family these may be seriously affected by the presence of the defective child in the home. It is truly a kindness to the child to send it where it may receive the best possible opportunity to attain a life of at



least moderate usefulness and happiness. The age of six to ten years should see any child mentally defective placed in the surroundings and under the training best adapted to its condition and its possibilities.

Marriage and procreation should be made impossible for these defectives, as they reach puberty. Sterilization performed before puberty usually gives opportunity for a free, happy, unemotional, obedient and fairly useful life. If sterilization is not secured, emotional storms, disobedience, criminal acts which may be horrible, and marked antisocial tendencies may require constant supervision and often restraint.

**Prognosis.** No attempt at prognosis should be made until educational methods have been employed with persistence and skill. Often a child kept at home, under no training or under the training of persons without special training, is found without any apparent mentality, or with very feeble mentality. Such children, placed under the care of skillful persons, often make surprising progress, or they may show little or no gain. It is not ever possible to determine the possibilities of the brain until every possible sane effort has been made to secure its development.

### MONGOLIAN IDIOCY

This type of mental defect is characterized by mental deficiency and by peculiar facial form, so that the child resembles some Mongolian race, whence the name.

**Etiology.** The cause is, as yet, obscure. Heredity plays no recognizable part; syphilis and alcoholism in the parents has not been found to be responsible for this defect. The only factor found frequently in the history of these children is the considerable age of the mother, but this is not always present. The last child in a large family, and the child of a mother over forty years old, or even over thirty-five years old, may be a Mongolian idiot. Some authorities find that the child of a mother whose general health is greatly depleted, or who has suffered from pelvic disease is apt to be of this type. But there are thousands of mothers in depleted health, suffering from pelvic diseases, and more than thirty-five years old, for every Mongolian idiot born.

There are no definite brain lesions, but all the convolutions seem smaller than normal, and the gray matter is thinner. The larger cells of the cerebral cortex are scanty.

Probably at least half of the children born with mental defects are Mongols, but on account of their tendency to early death, only a few are found older than eight or ten years.

**Symptoms.** The face is characteristic, and a glance gives the diagnosis in typical cases. The slanting eyes, the broad flat bridge

of the nose, and the overdevelopment of the epicanthic fold are very distinct in nearly all cases. The slant of the eyes is due to the higher position of the outer canthus than the inner. The palpebral fissures are nearly always narrow. The epicanthic fold may almost cover the angle of the eye.

The entire physical structure is subnormal. The muscles are deficient in tone and the ligaments are weak, and as a result of this atony the limbs may be placed in very unusual positions. Drooling and nasal discharge are common; the skin below the nose and the mouth may be excoriated. The tongue may be thick and protruding as that of a cretin. Various visceral deformities, especially of the heart, are very commonly found at autopsy. The nasopharynx is small, and slight amounts of adenoid growth may interfere with breathing.

Mental development is greatly retarded, but seems fairly normal otherwise for a few years. They usually begin to hold up the head at about the end of the first year, and to walk at the end of the fourth year. They may learn to speak a few words, but rarely to use language in the expression of definite thoughts. They are always restless and inattentive, and are often disobedient and extravagantly emotional. It is very difficult to teach them, and they very rarely attain the mental development of a normal child five years old.

The diagnosis of Mongolism may sometimes be evident at birth, but it is rarely advisable to make such a diagnosis, since the condition may be more apparent than real. Within a few weeks it should be possible to determine definitely whether the condition is truly that of Mongolism and some member of the family informed as to the probabilities of the further outcome. Great care must be used in order to avoid making a bad prognosis without proper basis.

**Treatment** is useless in typical cases. The administration of thyroid extract has been followed by slight improvement in a few cases, but no definite good has, as yet, been accomplished.

**Prognosis.** These children are very susceptible to infection, and they usually die before the age of ten years from some infectious disease. If they live to adult life, the genital organs do not develop, they attain no further mental development and, very rarely, may retard to complete amentia.

## CHAPTER LXVIII

### HYDROCEPHALUS

An abnormal accumulation of cerebrospinal fluid within the cranial cavity is not an uncommon abnormality. Several types are recognized, and of these chronic internal hydrocephalus is by far the most common.

**Etiology.** Many causes of hydrocephalus are recognized. All of these fall into two classes. The most common causes are those associated with an impediment to the drainage of the ventricles. Inflammations of the meninges are rather less common causes, and both mechanical impediment and inflammations of the meninges may be present in any case.

Basilar meningitis is a cause of acute hydrocephalus. This is discussed with other tubercular diseases.

Hemorrhagic pachymeningitis, meningeal hemorrhage, cerebral atrophy or malformations most commonly cause external hydrocephalus.

Obstruction of the drainage of the ventricles may be due to malformations, in which case the cerebral aqueduct (aqueduct of Sylvius) is most commonly absent. Its place is taken by neuroglial and connective tissues amidst which lie islands of ependymal cells which may or may not show a definite lumen, blind at both ends. Obliteration of the foramina of Magendie or Luschka is almost invariably due to inflammation of the meninges. Meningitis may be either intrauterine or extrauterine.

Tumors of the brain may obstruct the third ventricle or the aqueduct, and thus cause hydrocephalus. Operation upon spina bifida or encephalocele may so increase the pressure of the cerebrospinal fluid as to cause hydrocephalus.

#### Types of Hydrocephalus

**Congenital hydrocephalus** may be marked at birth, and the size of the head may be so great that birth is impossible until the skull has been punctured and the liquid drained away. In other cases the condition responsible for hydrocephalus are present at birth, but the head does not begin to enlarge or any other symptoms be noted until the baby is several weeks or a few months old.

**Chronic hydrocephalus** is characterized by the presence of a considerable amount of water outside the brain, in the subdural space. It is very rare, and is due to pachymeningitis or serous meningitis. The amount of fluid rarely exceeds 200 c.c., but in very rare cases may be much more; in this case the head becomes very large.

**Hydrocephalus e vacuo** is due to atrophy of the brain, as in porencephalus or in general atrophy of the brain.

**Acute hydrocephalus** is due to basilar meningitis, usually tubercular. Other types of meningitis, due to any infection, are due to less common causes. The fluid accumulates in the ventricles alone or in both the ventricles and the subdural space.

**Diagnosis.** The symptoms are those of increased intracranial pressure, such as headache, vomiting, cerebral paralysis, choked disc, pupillary irregularities and occasionally convulsions. The amount of fluid in the brain rarely exceeds 120 c.c. or about four ounces.

Recovery sometimes occurs, but in severe cases the condition is fatal.

### **Chronic Internal Hydrocephalus**

Chronic internal hydrocephalus is by far the most common type and its importance warrants a more extended discussion.

This type is so common and so serious that when the term "hydrocephalus" is used without any qualification this type is that referred to.

**Etiology.** The causes of the disease may be those associated with organic obstruction to the drainage of the ventricles, to some condition which prevents normal absorption of the cerebrospinal fluid normally formed, or to some condition which causes increased secretion of the cerebrospinal fluid.

Obstruction is usually found in the region of the cerebral aqueduct (aqueduct of Sylvius) or in the foramina of Magendie or Luschka. In about half the cases the aqueduct is occluded. The aqueduct may be absent, and its place taken by a mass of neuroglia in which small areas of ependymal cells are found. These ependymal areas may occasionally be found surrounding a space which suggests the aqueduct, but which is blind at both ends. Tumors of the brain may occlude the aqueduct by pressure. The aqueduct may be obliterated by inflammation, but this is rather rare.

The obliteration of the meninges is almost invariably inflammatory. Serous meningitis or meningitis due to any infectious agent may cause adhesions and hardenings which close these foramina, and thus prevent the cerebrospinal fluid from flowing in the subarachnoid space as it does under normal conditions. Hydrocephalus results from retention in such cases as this.

The place of syphilis as a cause of hydrocephalus is a matter for further study. Several authors consider syphilis an important factor; others consider it almost or quite negligible, occurring only rarely.

It seems probable that cerebrospinal fluid is secreted more rapidly than normal when there is spinal bifida or encephalocele, and



that when these conditions are operated, thus diminishing the absorbing area for the cerebrospinal fluid, there is moderate retention of the fluid and thus a tendency to hydrocephalus. It is certainly true that adequate operations upon spina bifida and encephalocele are often followed by hydrocephalus.

Heredity seems to play a part in hydrocephalus. Two or more children in the same family are occasionally affected, and those who have recovered a mild attack of hydrocephalus in childhood often have children with hydrocephalus. No doubt the predisposing structures are inherited, and thus comparatively negligible other factors initiate hydrocephalus. Parental syphilis is a cause in some cases. Alcoholism, tuberculosis and neuroses are probably not of etiological importance. Consanguinity is of importance only when both mother and father are of families in which hydrocephalus occurs.

### Pathology

The amount of water varies according to the time which passes after the onset of the disease and before death. The amount may be only a few spoonful in a baby, or there may be almost or quite a pint drained from the head which is so large as to prevent birth. As time passes the amount increases steadily until three quarts or more may be drained from the brain at autopsy. The cerebral hemispheres are destroyed by the pressure. In children who have suffered from hydrocephalus for a year or so, it may be impossible to find any evidence at all of gray matter in the thin membrane which encloses the enormous cyst-like sack. The basal ganglia may remain almost or quite normal, but they also usually show the flattening due to compression.

In examining the brain of a hydrocephalic child at autopsy great precaution is necessary to prevent destruction of the brain when the skull is opened. If the body can be frozen the examination can be made in a satisfactory manner. Formalin can be injected into the brain by way of the carotid arteries. The injection should precede the autopsy by four hours or more.

In congenital cases the meninges seem normal. A tumor or some other condition occluding the aqueduct is nearly always found.

In acquired cases the meninges usually show thickenings and adhesions. The fluid may be thin, yellowish, clear, or greenish, or it may be purulent. In non-inflammatory states the albumin is increased and cells are abundant; the fluid may be purulent.

The aqueduct is usually obliterated by gliosis. The cerebral hemispheres are thinned by the pressure of the fluid within the ventricles, and it may not be possible to find any brain tissue at all in the thin wall of the cysts. The ependyma and the pia mater form one membrane. The basal ganglia and the cerebellum are flattened, and usually present almost a normal appearance otherwise. The foramen of Monroe is dilated greatly; the foramen of Magendie may be dilated. The septum lucidum is either absent or very thin.

The bones of the skull are much thinned and the fontanelles are much larger than normal. The sutures are widely separated and may be represented by broad sulci. Wormian bones are usually present. The roof of the orbit is flattened in many cases, and may be concave. Premature ossification is occasionally associated with hydrocephalus, and in this case the bones of the skull are smaller than normal, and rather thicker than normal.

The pathogenesis of the disease has been studied within the last few years by Dandy, Blackfan and others. The cerebrospinal fluid is secreted by the choroid plexus. It passes to the fourth ventricle by way of the cerebral

acquired (acquired of Sylvius) and thence through the foramina of Magendie and Luschka into the subarachnoid space. The various cisterna around the base of the skull offer facilities for absorption. Normally absorption from the subarachnoid space is equal to the secretion. Probably there is never too small secretion or too rapid absorption. Abnormalities are due to deficient absorption or too rapid secretion or to an impediment in the pathway of the cerebro-spinal fluid. When there is too rapid secretion, the absorption is less than the secretion and the fluid accumulates abnormally. When there is impediment in the channels, fluid accumulates.

### Diagnosis

The symptoms may determine the diagnosis. Congenital cases may have so large a head as to prevent normal birth. They usually show no symptoms for several weeks or a few months after birth. It is then noticed that the head is growing more rapidly than normal, and that symptoms of pressure occur. In acquired cases, the head may be almost as greatly increased in size if ossification has not yet become well advanced. When the bones of the skull are ossified, the head may not show any marked increase in size. The normal baby's skull increases in circumference about half an inch each month. The hydrocephalic skull may increase two or three inches in circumference each month. If the increase is one inch in one month and if the symptoms of pressure occur, the condition is probably of one hydrocephalus. (Brain tumors may cause this enlargement, but they are very rare, and localizing symptoms are usually present with brain tumor).

The child soon becomes unable to hold up the heavy head. The muscles become weak, and emaciation may become very profound. Vomiting, diarrhea and anorexia may cause emaciation and weakness before the head becomes recognizably enlarged, especially when hydrocephalus is acquired after ossification of the skull bones is well begun.

Symptoms of intracranial pressure follow. The child is apt to become dull and apathetic, but mentality often remains remarkably acute, considering how great is the loss of the tissue of the cerebral hemispheres. Vision and audition become dulled and may be lost completely. The pupils are equally affected; usually they are contracted, but they are occasionally dilated or normal. The pressure upon the roof of the orbit may cause the eyes to be protruded and they are usually turned slightly downward, so that the sclera is visible above the pupil. Optic atrophy, and less frequently, choked disc are found when the hydrocephalus develops rapidly. Convulsions are not uncommon.

The muscles of the body are weak and small. Paralysis may be flaccid or spastic, or certain groups may be flaccid and another group spastic. In some cases no paralysis is present. The muscles of limbs are rigid, and there is a tendency to clenching of the hands, usually with the thumbs adducted.

According to Dandy and Blackfan, the three types of hydrocephalus can be differentiated by the use of phenolsulphonephthalein. First the renal function must be tested. Six milligrams of phenolsulphonephthalein dissolved in one cubic centimeter of sterile distilled water are first injected into a muscle, usually the pectoral. After this, all urine passed in two hours is saved, and at the end of two hours the bladder is emptied. This urine is mixed together, and enough water added to make one liter in all. This is made alkaline with sodium bicarbonate. A standard alkaline solution containing six milligrams of phenolsulphonephthalein is prepared and this is used as a standard for determining the amount of the dye excreted. Normally, from 60% to 80% of the dye is excreted within two hours, and the entire amount within a day. If less than 60% is contained in the urine passed within two hours, the renal function is subnormal. The functional inefficiency is determined with accuracy by the percentage of the dye excreted in two hours, and by the time required for the total excretion. If the renal function is normal or only slightly subnormal, the further tests for the types of hydrocephalus may be carried out, making the renal function a guide for the excretion of the dye. The alkalized urine should be perfectly free from color for several voidings.

The same amount of the dye in the same solution is then injected into a lateral ventricle. This is done by outlining the superior fontanelle, and sterilizing the skin with iodine or other solution. The needle is inserted at the lateral angle of the fontanelle, and if this is small the needle should be directed slightly outward, so as to avoid the sinus. Five minutes after this injection lumbar puncture is performed. The cerebrospinal fluid thus secured may be alkaline, in which case the dye appears. If it is not alkaline, bicarbonate of soda may be added until the reaction is alkaline. The urine is then collected for two hours, and tested as before. If the cerebrospinal fluid taken five minutes after the injection is red, there is no obstruction. If the urine shows no color, or if the color is much less than was found in the urine after the intramuscular injection, there is subnormal absorption of the cerebrospinal fluid.

If the cerebrospinal fluid obtained at lumbar puncture, five minutes after the intraventricular injection of the dye, shows a trace of color, and if the urine shows excretion of the dye within the same time, or a slightly shorter time than was noted in the determination of the renal function, the hydrocephalus is due to excessive secretion of the cerebrospinal fluid.

This differentiation is chiefly valuable in determining the prognosis. Obstructive cases are fatal, usually within a few months. Cases with excessive secretion may recover, and cases with deficient absorption usually recover.

Differential diagnosis presents few difficulties. The rickety head is large and square and does not grow rapidly; the hydrocephalic head is large and spherical and does grow rapidly. Rickety symptoms are associated with the rickety head. The rickety child may be hydrocephalic. Brain tumor usually shows localizing symptoms, and there is no rigidity of the limb muscles in brain tumor. In acquired hydrocephalus in children with fairly well ossified skulls, the differential diagnosis between hydrocephalus and brain tumor may be impossible.

### Treatment

Treatment is not very satisfactory. In a few mild cases with deficient absorption the relaxation of abnormally rigid cervical muscles and the correction of cervical lesions may lead to recovery.

The application of a moderately tight rubber band around the head may promote absorption; this method is advised by some

authors, for suitable cases, but is considered useless by others. There should not be any great pressure exerted and no pain or undesirable symptoms should follow its application or its use for several days. Thus applied, there is probably no harm in it. It is of no value, and may be harmful, in those cases in which excessive secretion is present.

The use of thyroid extract in those cases with hypersecretion is advised. If there is any reason for supposing hypothyroidism present the administration of the dried gland should be useful. Frazier supposes the thyroid to exert an inhibitory effect upon the secretion of the cerebrospinal fluid.

Tubercular and syphilitic cases should receive the treatment best adapted to these diseases.

Repeated lumbar punctures have given temporary good results in those cases without obstruction. Recovery may be encouraged by this method, but in most cases it gives only temporary results.

Puncture and drainage of the ventricles have given temporary good results in cases with obstruction. Puncture of the corpus callosum drains the third ventricle and this is occasionally advised. The establishment of permanent drainage from the brain has been attempted. The jugular vein, the subarachnoid space and the subcutaneous tissues have been tried, but no permanent good results have followed these operations. The decompression operations have given temporary relief. The formation of a window by removing part of the parietal or occipital bone, and suturing the sectioned dura into the tissues outside of the skull has given good results in cases with deficient absorption. The subarachnoid fluid thus escapes into the tissues outside of the skull. Permanent good has not been reported after this operation.

### Prognosis

The outlook is always grave. Patients with hydrocephalus due to subnormal absorption more often recover, but these are the most rare of all cases of hydrocephalus. Cases in which there is obstruction are probably always fatal. Cases due to syphilis or tuberculosis may recover from the hydrocephalus when the primary disease disappears. Meningitis causes a type of hydrocephalus which is almost invariably fatal.

The course of the disease is variable. Congenital cases may be well advanced at the time of birth, and it may be necessary to puncture the skull, permitting the escape of the fluid and collapse of the head, before birth is possible. When the size of the head is recognized before birth, Cesarean section is sometimes performed and the baby then lives for a time. Usually these babies die within a few days or, at most, a few weeks.



When the enlargement of the head does not appear until some weeks after birth, the course of the disease may be prolonged for some months. Nearly all of these babies die within the first year.

Mild degrees of hydrocephalus are compatible with normal mentality and normal life. More serious cases may recover, but with defective mentality. Complete recovery is very rare. Death usually occurs from some intercurrent disease, when the hydrocephalus itself is not speedily fatal.

## CHAPTER LXIX

### EPILEPSY

Epilepsy is a chronic disease of the brain characterized by periodical attacks of unconsciousness, with or without typical convulsions, usually preceded by an aura of sensory or other disturbances and followed by deep sleep.

**Etiology.** Lesions of the occiput and the upper cervical vertebra are invariably found in children with either grand or petit mal. Lesions of the lower thoracic vertebra and the corresponding ribs are almost constant. Lesions of the upper lumbar vertebra are usually present. Lumbo-sacral lesions may be found, especially in children who have suffered many falls.

The occipital lesion and the upper cervical lesions affect the cervical sympathetics and thus interfere with the normal control of the meningeal, and probably the cerebral arterioles. These lesions are almost invariably associated with tension of the cervical and hypertonicity or contractions of the cervical muscles. These, in turn, raise the upper ribs, diminish the area of the thoracic inlet and thus interfere with normal drainage of the blood and the lymph from the brain.

Upper lumbar and lower thoracic lesions interfere with the intestinal functions and tend to weaken the muscles of the intestinal walls. Thus there is great tendency to autointoxication in children with these lesions. The lesions of the lower thoracic vertebra and the corresponding ribs also interfere with the gastrointestinal activity, and with the circulation through the liver.

Heredity is a common cause of epilepsy, or, at least, of the imperfectly developed brain which predisposes to epilepsy. In about half the cases of epilepsy a family history of epilepsy, hysteria or other functional disease of the central nervous system can be found. The disease follows Mendel's Law fairly closely, and is a recessive trait under that law.

Alcoholism in the parents is usually included among the causes of epilepsy, and it is generally supposed that a productive intercourse following a few days of drunken spree is especially apt to cause epilepsy in the progeny. If the productive intercourse occurs on the first day of the spree, no evil results are apt to be suffered by the young. This is not known to be true, and yet, when it is remembered that the germ cells are alive, that they are more subject to adverse effects when they are most active, that is, when they are undergoing maturation, it is easy to see that the relations mentioned above have a physiological foundation.

Syphilis seems to cause epilepsy only by causing the hemorrhages and the imperfect development of the brain, which, in turn, tend to cause epilepsy.

Convulsions occurring during childhood, due to spasmophilia or tetany probably do not tend to produce epilepsy. On the other hand, convulsions which have been considered tetanic, spasmophilic or of non-epileptic nature may have really been cases of epilepsy from the beginning, but which have not been correctly diagnosed.

Traumatic causes are probably more frequent than is generally supposed, since several months or several years may elapse between the trauma and the epileptic attacks. A fall or blow upon the head may cause slight hemorrhages or slight injury to a small area of the brain substance. The child may not even be rendered unconscious by the blow, and his mother may not know anything about it. This tiny injury seems to leave no ill effects, but the glia cells multiply, and there may be neighboring connective tissue cells which multiply. A small hardened area is thus produced, this diminishes in size, as such scars always do, and thus an irritative lesion in the brain is produced.

Any acute inflammatory disease may cause a slight or severe meningitis or encephalitis, and the adhesions thus produced may cause epilepsy.

Symptomatic epilepsy (secondary epilepsy) is due to some gross or recognizable lesions of the brain. Tumors, cysts, meningitic adhesions, sclerotic areas or other pathological conditions affecting the brain structures may cause epileptic attacks not to be differentiated in any way before autopsy from the typical idiopathic epileptic attacks.

Given the epileptic predisposition, the attacks may be precipitated or may be increased in frequency or severity by any one or more of a long list of factors. Of these, digestive disturbances seem by far the most important.

Meat-eating is frequently responsible for attacks. In many children the attacks are very infrequent and very mild so long as the child eats no meat or meat broths. In a few of these children eggs are tabu; in others cheese, and in others milk. It is very rare that both eggs and milk or cheese are harmful. In all children who are adversely affected by any one or more of the proteid foods, meat is included as a harmful food.

Constipation is always a factor in precipitating the attacks and increasing their frequency.

Dilatation of the stomach is rather frequently found among epileptics, and when proper treatment is given for this condition, the epileptic attacks are apt to become less frequent, if not less severe.

An abnormally long colon has been considered responsible for epilepsy by some recent authors, but it now seems probable that this is, like constipation, one of the factors which increase the frequency and severity of the attacks in a child already epileptic.

Toxemia is an important factor. Whether it is due to improper eating, to hyperabundant colon, to constipation or to some other cause, it always affects the epileptic child adversely.

Emotional storms may precipitate an attack. But if the attacks are always, or almost always, preceded by an emotional storm, grief, disappointment or other affectional disturbance, it should be suspected that the attacks are really hysterical rather than epileptic.

### Pathology

Tissue changes are variable and inconstant. Autopsies performed upon those dead from symptomatic epilepsy discover the tumors, scars, cysts, hemorrhagic areas and other structural conditions responsible for the epileptic attacks. In many cases the condition considered idiopathic epilepsy during life has been found, at autopsy, to be associated with gross cerebral lesions.

In idiopathic epilepsy the brain rarely shows any recognizable gross lesions. (Any definite structural brain lesion immediately places the case in the symptomatic class). Microscopical examination of the brain, taking sections from many areas, always shows some gliosis, but this is not constantly located in the same area in different patients. The horn of Ammon is a common location for gliosis. It is very rare that typical and marked gliosis is found in the brain of children not epileptic and not subject to insular sclerosis.

Pathogenesis is not yet well understood. It seems very probable that the gliosis is the result of some mild inflammation or trauma, and that this causes abnormal irritability of the neighboring nerve cells. These are, then, easily affected by toxic conditions or by abnormal stimulants. All parts of the cerebrum are in close relationship with the motor cortex, and, when any discharge of nerve impulses from the abnormal area occurs, the natural result must be either a storm of motor impulses, or an inhibition of consciousness, or both.

### Types of Epilepsy

**Jacksonian epilepsy** is really a symptomatic form. The attacks begin with the movement of a certain limb, and from this radiating areas of muscles take part in the convulsive movements. The area in the cerebral cortex which controls the first muscle or group of muscles affected in the location of the lesion is responsible for the attacks. A sensory aura occasionally occurs in this form of epilepsy, and it is, when present, usually referable to the site of the lesion when this is not in the motor cortex.

**Grand mal** (major epilepsy) is the attack commonly called by the name of "fits". This is the type ordinarily referred to when the term "epilepsy" is employed without qualifying phrase. This attack is most frequently ushered in by an "aura" which may be either sensory or motor, or, less commonly, vaso-motor or psychic. Sensory auras include strange smells, sights or sounds, blindness, deafness, sensations of warmth which may be local or general, nausea, and a sense of pain, numbness, pricking, pressure or an



indescribable sensation located in the pharynx, stomach, heart, vertex of skull, root of the nose or any part of any extremity. Motor auras include complicated movements, such as running, whirling on the feet or toes while spitting violently or shouting. Simpler movements include waving the hands, repeating words which may or may not have any meaning, tapping with one finger or one foot or making peculiar faces. Motor auras also include pseudo-paralytic states, such as inability to speak, paralysis of one limb, paralysis of the entire body, and many other similar states. Vaso-motor auras are not so common as are the sensory or motor. Flushing of one side of the face or both sides, or some other part of the body; vomiting, micturition or defecation, cardiac irregularities and many other phenomena may be found.

Psychic auras are most frequently emotional or affective. The most common is a deep and horrid sense of fear. Anxiety, restlessness, fatigue, anger and distrust are less common.

Auras are very transient, lasting usually a few seconds, and almost never more than half a minute. A long period of aura should lead to the suspicion of some other than idiopathic epilepsy. The aura may be entirely absent, in which case the attack is very sudden.

Loss of consciousness, a sudden, peculiar cry, dilatation of the pupils, pallor, beginning spasm and the fall follow one another so rapidly that all these phenomena seem to be instantaneous. The tonic spasm lasts for a few seconds or half a minute; the entire body seems to be affected. The head is retracted and drawn to one side; the jaws clenched, often biting the tongue; the face purple or cyanotic; the limbs rigid, extended or bent at elbows, wrists, knee or ankle, the fists tightly clenched and the toes flexed and respiration ceases on account of the rigidity of the thoracic muscles. This tonic stage is immediately followed by clonic contractions resembling those of eclampsia, which persist for two or three minutes, rarely more. The tongue, which may have been held between the teeth, is chewed and bitten, there is foaming at the mouth, with occasionally streaks of blood in the saliva, the face is distorted with variable contractions of the muscles of expression, the arms and legs jerk around, usually repeating the same type of movement many times, the face remains cyanosed or shows some relief, the respiration is irregular and jerky, with clonic contractions of the respiratory muscles. Unconscious defecation and micturition usually occur during this stage, if the bowels and bladder do not happen to be empty. After one or two minutes the movements become less violent, and gradually they cease altogether. The child passes into coma with the cessation of the movements; he has been unconscious since the onset of the attack. The period of coma may last only a few minutes, or may persist for half an hour or more. If

the child is not disturbed, this coma is immediately succeeded by deep sleep, from which he may not awaken for several hours, or until the next morning. Sometimes he awakens from the coma, confused and sometimes only semi-conscious. He may be very weary, or the muscles may ache badly and may show bruises, and he usually has more or less headache. These symptoms are generally less marked in those who pass from coma into deep, natural, refreshing sleep. Fever of slight degree usually follows the fit, and the urine often shows albumin and casts.

This typical attack is not always found. The tonic contraction may occur first in one limb; this is not necessarily a Jacksonian epilepsy, but this Jacksonian type should be suspected.

**Petit mal** (minor epilepsy) is the more serious in prognosis, but the least serious in symptoms. There is rarely a definite aura, such as is common in grand mal. Vertigo and dizziness may serve as an aura in some cases. In the simplest attack, the child simply loses consciousness for an instant, so small a time that it is not possible to measure it. If he is talking he is apt to stop suddenly, just a sort of hesitation, and then go on as if nothing had happened. He may not be aware that anything has happened, and the parents and associates may not recognize anything more than an odd habit. He may drop any article which he happens to have in his hand. In more marked attacks, the child becomes unconscious, may perform some automatic act, such as undressing, or may show some slight twitchings of the muscles. He may stagger or fall, or may hurt himself in some way.

**Procurive epilepsy** is properly included with the petit mal attacks, but differs from these in the more serious character of the attacks. There is usually a very short aura of mental confusion, a slight dizziness or vertigo. The child immediately begins to run as fast as he can, sometimes in a straight line, sometimes following some complicated pathway. He retains any objects which may be in his hands, and he does not attract any attention to himself except by the fact that he is running fast. When he is completely wearied he falls into coma or deep sleep, which may continue for ten to thirty-six hours. He awakens weary but otherwise normal. He does not know where he is, nor how he reached the place where he awakens.

**Psychic epilepsy** (epileptic equivalent) also bears some resemblance to petit mal, with which it is often included. The child becomes unconscious, and while he is unconscious he passes through various motor or sensory states. One child, nine years old, thought herself visiting the "Katzenjammer kids" during their days of honor in the Comic Supplement. She told of their exploits with great glee, when she awakened. Rarely the vision is unpleasant.

Motor acts may be extremely embarrassing. The patient, who may be at puberty or even older, may undress and lie down as if going to bed. He may void urine or feces in public, or he may perform various peculiar acts, not always unpleasant in nature.

**Nocturnal epilepsy** (*epilepsia larvata*) occurs only at night. Cases of nocturnal epilepsy may be confused with nocturnal enuresis. If the child has a room alone nocturnal epilepsy may remain unrecognized for months. This type may precede the diurnal and more serious type.

Status epilepticus is a condition in which the attacks of grand mal follow one another so rapidly that consciousness is not regained between the attacks. It usually indicates a fatal termination, but very often it has no such significance. Status epilepticus may persist without relief for two days or more, and yet the child recover his previous health. Normal mentality is not to be expected, when so severe a type of epilepsy is present.

In all types, the onset is usually gradual. A few attacks of petit mal or grand mal may occur at long intervals. The attacks become more and more frequent. Nocturnal epilepsy is followed by the ordinary type, and the nocturnal attacks may finally disappear, or they may increase in severity and in frequency until the child dies.

When petit mal is the first type noted, the onset of grand mal may be expected. When grand mal is the first type, the onset of attacks of petit mal makes the prognosis extremely gloomy, and often precedes marked mental dullness.

### Diagnosis

Laboratory diagnosis is useful in distinguishing epilepsy from certain other convulsive attacks. The urine shows albumin, casts and some renal epithelium after an epileptic attack; this is not the case in hysterical fits. The blood is always of more immature type than is normal for the age of the patient. The leukocytes are relatively lower in number and have a lower nuclear average. The lymphocytes include large, small and medium cells, as is the case in embryonic blood. Toxemia is common among epileptics, and this shows in the blood cells by irregular nuclei, atypical granules, ragged nuclei and ragged protoplasm and the presence of naked nuclear masses in the serum. The viscosity is always high, and the water content always low.

Diagnosis is easy in typical cases. Atypical cases present great difficulty. A single convulsion, attack of unconsciousness or psychic erraticism should never be considered proof of epilepsy, but the condition of the child should be studied until he has suffered several attacks and these should be carefully scrutinized. During this study treatment should be given for the correction of bony lesions, the relieving of toxemia and the formation of normal habits.

Nocturnal epilepsy is suggested by persistent bed-wetting in an older child, or by the occurrence of bed-wetting in a child who has already developed control. If the child shows a sore, bitten tongue on the morning after the bed has been wet, the diagnosis of epilepsy becomes probable. Some older person should then watch the child during the night, in order that any convulsive seizures may be recognized.

Minor epilepsy is often difficult to recognize. If no loss of consciousness can be determined after thorough study and by means of several tests, the condition is not epileptic. If there is a loss of consciousness, no matter how brief, the diagnosis of epileptic attacks (*petit mal*) becomes probable.

Differential diagnosis may be very difficult. In eclampsia the fits are very like those of epilepsy. The etiological factors of eclampsia are usually easily recognized. Epilepsy rarely occurs in little babies, while these are most subject to eclampsia. The symptomatic type of epilepsy may be found in tiny babies, but in these and in older children the etiology of the symptomatic type is usually found.

Minor epilepsy is rarely confused with syncope. In syncope the fall is less sudden, there is never any twitching, the face is very pale, urine and feces are never passed, the tongue is not bitten and syncope does not recur without due cause.

Hysteria may imitate grand mal very closely, especially if the hysterical child has been associated with an epileptic child or older person. Hysterical attacks do not cause involuntary micturition or defecation, and the tongue is rarely bitten during an hysterical attack. In hysteria the color-visual fields are restricted; this is an excellent test for differential diagnosis. The color visual fields are restricted also in brain tumor and in certain other rare conditions, but they are not restricted in idiopathic epilepsy.

The hysterical patient often remembers occurrences during the attack, though these children often deny memory of the events. If statements are made as to occurrences which did not occur during the attack, the child is apt to correct the misstatement. A certain amount of ingenuity is necessary in order to secure the statements of the child as to details of the occurrences during the apparent unconsciousness without arousing suspicion. Mental deterioration is not characteristic of hysteria.

Minor epilepsy sometimes cannot be differentiated from hysteria. Questions, examination of the color visual fields, and the blood examinations usually make the diagnosis clear. The careful use of some of the methods of psychoanalysis usually differentiates hysteria.



The differentiation of idiopathic from symptomatic epilepsy is frequently a matter of grave difficulty. The presence of slight or grave paralysis of cerebral type, the fact that the fits had at one time been localized, and that they always or usually begin with a certain motion of one limb or the head indicate symptomatic or Jacksonian epilepsy. Headache, the absence of the epileptic psychology, the absence of mental deterioration and history of difficult labor, trauma or infection which might be associated with meningitis of mild degree all lead to a probable diagnosis of symptomatic epilepsy.

**Treatment** of idiopathic epilepsy may be devoted to the diminution of the cerebral abnormality which permits or produces epilepsy, and to the removal of the conditions which precipitate an attack. In a considerable number the latter method is immediately successful.

Gliosis of the brain is unquestionably encouraged by toxemia and by emotional storms. The avoidance of these factors is indicated.

Lesions of the occiput, the upper cervical region and lesions of the lower thoracic and upper lumbar region must be corrected. Not even the slightest trace of tension of these area should be permitted to remain. This may require weeks of endeavor, but it is extremely important that these structural relations be made normal. Anything which interferes with the normal drainage from the brain must receive suitable attention.

In order to increase the water-content of the blood, the child should be trained to drink water very freely, at first he should take a drink every half hour, and when the blood shows better conditions he may drink every hour. This habit should be continued until the fits have ceased. With this, he should be given much fruit and fruit juice.

The diet requires much attention, and this is a difficult matter to arrange on account of the epileptic psychology. He may have no meat at all, a small amount of eggs and milk, if these agree with him, and abundant supplies of fruit and vegetables. The raw vegetables are especially desirable.

Dr. Hugh Conklin, of Battle Creek, has been securing excellent results by giving long fasts. The length of the fast depends upon the condition of the patient. Orange juice is employed when necessary for the relief of acidosis or renal complications.

Several osteopathic sanitariums report good results by the use of the milk diet, or the milk and fruit juice diet. The use of gruel instead of milk is advised for certain peculiarities of physiology. In a few cases the attacks have been absent for as long a time as the child remained upon a liquid diet, but at each indulgence in solid

food the fits return. In other cases the child is permitted to have one article of food at each meal. When more than one article is eaten, digestion is disordered and the fits return. In every case there is a diet best fitted for that child, and it is often only after a trial of several diets that the fits can be kept to a minimum or eliminated altogether.

Hygienic conditions must be kept as nearly normal as possible. It is best for these children to be taught at home, if this is possible. It is not good for the child with fits to be associated with other children, and it is not good for other children to be associated with one who has fits.

In order to keep the digestive tract well cleansed, it is usually necessary to give enemas at regular intervals. In these children there seems to be a permanent lack of power on the part of the intestinal walls. While this weakness may be due to the lesions mentioned, it does not seem that correcting the lesions improves the tone of the muscles very speedily. After the epilepsy disappears, or the fits become rare and mild, the tone of the intestinal muscles improves. It is much better to keep the digestive tract clean by enemas than to let the child suffer on account of the weakness of the bowel walls.

Symptomatic epilepsy requires the treatment of the primary disorder. Surgical removal of local scars, areas of gliosis, blood clots, and other causes of symptomatic epilepsy usually gives excellent results for a few weeks or months. Further adhesions, with the retraction of the newly formed connective tissue, later causes recurrence of the attacks and these are sometimes worse than before. Still, in selected cases, the surgical removal of the focus of irritation or the performance of a decompression operation may give permanent good results.

The medical treatment is the use of some preparation of the bromides. This results in progressive mental deterioration, even with the most careful medication. Unskillful use of the bromides always, and skillful use sometimes, causes ugly eruptions upon the face and elsewhere. A long list of other drugs are mentioned only to be condemned. In rare cases a child with epilepsy screams so that rest is not possible for himself or the other members of the family. These cases are usually symptomatic, and are due to some incurable brain disease. The use of quieting drugs may occasionally be advisable in such cases, in order that the other members of the family, perhaps even the neighbors, may secure some rest.

**Prognosis.** The outlook is gloomy in all cases. Life is not greatly shortened by epilepsy, directly. Recovery from idiopathic epilepsy is hardly to be expected. Intervals free from fits, perhaps of several years duration, often follow treatment. Hereditary

epilepsy has extremely gloomy prognosis as to freedom from fits and as to mental stability. Syphilitic, tubercular and meningitis eases have the best prognosis, if these disease receive proper attention and if the treatment advocated in an earlier paragraph is administered.

Mentality is invariably affected. The epileptic psychology is practically invariable in idiopathic eases. Symptomatic eases do not display the selfishness, obstinacy, instability and cruelty characteristic of idiopathic epilepsy. Deterioration is to be expected in both symptomatic and idiopathic eases.

The status epilepticus may cause death from exhaustion. It is, however, very surprising to see how often status epilepticus may persist until the child seems to be dying, and yet the fits rapidly diminish, the child pass into coma and slumber, and finally seem to be almost or quite as well as before the severe attacks occurred.

Death from accident is rather common among epileptics. They try to take care of themselves, almost invariably. But a fit may throw them into deep water, or into fire, or over a high cliff, or from a high building or a high window, and they may die from these accidents. There is no pain associated with these deaths, for the epileptic is unconscious at the time of an attack. When they are hurt and recover, they have no memory of the accident.

### The Epileptic Psychology

The mental outlook of the epileptic child is peculiarly unfortunate. The gliosis and the toxemia may be responsible, in part, for the cruelty, obstinacy, and isolation of the epileptic. On the other hand, from the onset of the fits he has been set apart by them. He cannot play with other children on equal terms; he knows himself the object of an adverse fate, and that he in no way responsible for his misfortune. The very fact that he is subject to some influence over which he has no control makes him unsocial and sullen. The fact that there is no cure for the condition adds another element of unwholesomeness to his viewpoint. It is not strange that epileptics almost invariably become sullen, selfish, solitary and cruel, and subject to attacks of violent anger upon slight provocation. Their love is a cruel love, and yet they are capable of sudden great sacrifice.

With the relief of the toxemia there is, in some cases, an approximation to normal mentality. In those cases treated by fasting, the mental changes are sometimes very surprising, even though the epileptic attacks may not be greatly modified. Patients who recover from epilepsy may regain in part a normal mentality, but in most cases selfishness, obstinacy and cruelty persist throughout life.

When epilepsy begins early in life, mental deterioration is inevitable. Probably there is always some cerebral injury in these

early cases. At any rate, if idiopathic epileptic fits begin before a child is five, he may be expected to be without mentality if he lives to be twelve years old. If the fits begin before he is ten, he may be expected to be almost in the mental state of an imbecile before puberty. If the fits begin before or during puberty, he may attain fairly normal mentality, though he is always subject to the epileptic psychology.

Unusually brilliant mentality is occasionally associated with epilepsy which originates at puberty or afterward.



## CHAPTER LXX

### CHOREA

(Sydenham's Chorea; St. Vitus' Dance; Chorea Minor)

This is a disease of childhood, characterized by involuntary and irregular contractions of the voluntary muscles, without loss of consciousness and without gross lesions of the brain.

The name "St. Vitus' Dance" has an odd history. During the fourteenth to the sixteenth century a peculiar dancing mania was of frequent occurrence in Europe. Many of those so affected from this disorder, made pilgrimages to the shrine of St. Vitus, seeking relief. These dancing manias were probably hysterical, and they did not resemble the disease now known as chorea. The word "chorea" is from the Greek word meaning dancing, though the symptoms of the disease as we know them have no resemblance to dancing.

**Pathology.** The careful microscopic examination of the brains of children who die from chorea or from other causes during an attack of chorea shows evidences of acute inflammation of the brain, most marked in the corpora striata, but usually affecting the cortex also. The meninges may also show evidences of inflammation. The perivascular channels are filled with small round hyaline cells, the Nissl granules are subnormal, there are occasionally emboli of the arterioles and capillaries and when the meninges are affected there are many very small areas of delicate adhesions.

In about half the cases there are evidences of rheumatism in other parts of the body. Arthritis or lesions of the cardiac valves, or both, are common in this class of patients.

**Etiology.** Chorea is most common between the ages of five and fifteen years. It is rarely found during infancy. The youngest babies reported with chorea are about five months old. It is evident that chorea is most common during the years of most rapid development of the brain, and especially the development of the tracts associating the cerebral cortex with the corpora striatum and other basal ganglia. During these years children are especially subject to the acute infectious diseases.

Lesions of the lower thoracic vertebra lower immunity to infections. Lesions of the upper cervical vertebra and the upper thoracic vertebra interfere with normal control of the vaso-motor nerves to the meninges, and, probably, the brain itself. Lesions of the upper ribs, usually associated with lesions of the upper thoracic vertebra, diminish the size of the thoracic inlet, and thus with the drainage of blood and lymph from the brain. Upper cervical lesions are invariably found in children with chorea, upper thoracic usually, and lower thoracic in about half the cases examined.

These lesions must be considered very important in the etiology of chorea, and they also tend to perpetuate the disease when it is once established.

Sex seems to be important. About twice as many girls as boys suffer from chorea. Possibly the fact that boys have usually more exercise and fresh air accounts for this relationship.

Heredity is indirect. A neurosis is frequently found in the parents or ancestors, and occasionally a family history of chorea may be elicited by careful questioning. Two or more children in the same family may suffer from the disease, at the same time or at different times.

Season and climate have an influence. In temperate climates, in which the seasonal variations are marked, the largest number of cases occurs in March; the smallest number in November. Chorea is very rare in the tropics. Negroes and Indians are very rarely affected.

Epidemics are rare, but several have been known to occur. The disease may seem to spread from one child to another in a home, an institution of a school. Imitation accounts for some of these cases but not for all of them.

Infectious causes are probably important. About half of the children with chorea show symptoms of rheumatism, either before, during or soon after the chorea. Attacks of chorea often are associated with typhoid, scarlet fever, measles or other acute infectious disease.

Emotional causes are recognized by many pediatricians. The prevalence of the disease in the spring is, by them, supposed to be due to the long stress of the school year and the fear of the impending final examinations. Attacks of chorea occasionally follow severe fright, grief or embarrassment.

Reflex causes are responsible for choreic movements, but these do not cause inflammatory changes in the brain. Phimosis, adherent prepuce, adherent clitoris, ocular defects, intestinal parasites, nasal defects or inflammations, adenoids, defective teeth and the onset of menstruation in girls with pelvic deformities are very common causes of choreic movements which may greatly resemble true chorea.

**Symptoms**, in typical cases, are pathognomonic. The onset is gradual. The child seems, at first, to be careless and awkward. He drops articles from his hands, bumps into objects and people when he is walking, spills his food and cries at the slightest provocation. When the facial muscles are affected he makes queer grimaces and he may be severely and unjustly punished for this. The jerking movements may be supposed to be voluntary, and the child receive reproof and punishment instead of the treatment he needs.

Within a week or two weeks the jerking movements become so exaggerated and the child's pleas of his inability to control them so earnest that the parents recognize the fact that a serious disorder is present. He may become unable to dress or to feed himself. The

movements usually cease during the night, but in very severe types they may persist during sleep, and may awaken him by their violence. He is unable to resist the movements, and upon effort to control them he increases their severity. Emotional states also increase the rapidity and severity of the jerking.

In a characteristic case the child cannot sit still. The face twitches, the arms are alternately flexed, extended, abducted, adducted and rotated. The hands are extended with the fingers flexed or spread, and immediately the hands are flexed. The gait is disordered by the jerking of the feet, and walking or standing may become impossible.

Reflexes are somewhat exaggerated. A peculiar character of the patellar reflex is commonly found in chorea. The foot rises as in normal children, when the tendon of the quadriceps is tapped, but when the foot reaches the maximum elevation it stops for an appreciable time, and then drops back rather slowly.

Diadococinesis, the impossibility of rapid alternate pronation and supination of the hand, is usually present in the early stages of chorea.

The pupils are usually dilated but they react normally to light and to distance. The twitchings of the muscles of the orbit may cause peculiar visual sensations, and may cause temporary strabismus.

Speech may become impossible. When speech is seriously affected, a mental disturbance is usually present or impending,

Headache and pain in the back and limbs are common. Fever may or may not be present. In very severe cases of chorea, with violent movements, the temperature may reach 103° F. and remain at about that point for some hours, rarely a day or two.

Sensory disturbances are not common. Rarely a paresthesia is complained of, but commonly only a sense of fatigue and annoyance are present.

The affected muscles may become very weak. Occasionally a general weakness, apparently no worse in the affected muscles, is present. This weakness may be so marked as to resemble paralysis, and these children are sometimes brought for treatment for paralysis. On careful examination, the jerking movements, faint but perceptible, can be recognized.

Mentality is usually affected. The children become very irritable and bad-tempered. They laugh and cry extravagantly upon slight provocation, and are nearly always fretful, wilful and capricious. The obstinacy, selfishness and isolation characteristic of epilepsy is not common in children with chorea. When the disease persists for some months, or when it is very severe, mentality may be greatly affected. Idiocy, imbecility or moral imbecility are common results

of the more serious cases. Melancholia, mania, delusions and hallucinations are fairly common among children with severe chorea.

Urinary changes are inconstant. Increased urea is often found, but this is not constant. Albumin and glucose may be found in the urine in very severe cases. Albumin is usually found in the urine of children who have received the usual medical treatment of arsenic, the salicylates and opiates.

The cerebrospinal fluid has been found normal in a large proportion of cases. In others an increased cell count has been reported; the cells are nearly always lymphocytes.

The blood shows the characteristics of secondary anemia. Excess of eosinophiles, sometimes to 20%, has been reported.

### Types of Chorea

**Hemichorea** is a mild type. Only one side of the body is affected, and the jerking may be limited to one limb or the face, on one side alone. Tenderness on pressure over the affected areas or their nerves may be fairly severe. Pain which appears and disappears gradually, without apparent cause, is characteristic of hemichorea.

**Chorea insaniens** is not common, but occurs occasionally, among young girls who have overworked in school. In this the term "insanity of the muscles" is justified. The muscles are jerking violently and continuously, day and night. The skin of the knees, elbows and other parts of the body may be eroded by the continual motion against the bed or the clothing. Jactitation is severe. The patient is unable to take nourishment or attend to any physical need. Mania, hallucinations and delirium are severe. The temperature rises to 102° or to 107° F. and the patient may die. If she lives, profound exhaustion finally initiates stupor and deep sleep. She passes from this into apathy and melancholia. This may terminate in death after days or weeks, or she may recover after a long and tedious convalescence.

**Symptomatic chorea** (reflex chorea) is due to some irritation which affects the nervous system. Phimosis, adherent prepuce, adherent clitoris, intestinal parasites, ocular defects and many other abnormalities may initiate a functional disturbance which causes movements greatly resembling chorea. This form of chorea disappears almost immediately upon circumcision, the fitting of glasses, and other treatment adapted to the primary condition.

### Differential Diagnosis

Several other diseases are characterized by irregular muscular contractions. The differential factors are briefly mentioned in this connection. For atypical cases these conditions should be thoroughly studied.



Multiple sclerosis shows increased reflexes, spastic gait, no tendency to definite improvement, tremor and mental deterioration.

Hemiplegia may present great difficulty. The paralysis may be so slight as to escape notice, and the associated irregular movements very pronounced. On the other hand, the weakness of the muscles in chorea, with slight jerkiness of the muscles, may lead to an erroneous diagnosis of paralysis.

Athetosis is characterized by the slowness of the movements, their limitation, and the tendency of the hands to assume a peculiar position with the fingers spread and over-extended while the hand is strongly flexed at the wrist.

Hereditary ataxia is a more chronic disease than chorea. A family history is commonly found, ataxia, tremor, scoliosis, nystagmus, scanning speech make diagnosis in a typical case.

Hysteria may resemble chorea with remarkable accuracy. Imitation is the cause of hysterical chorea in some cases; in others the child who has not seen choreic children may spontaneously display the characteristic choreic symptoms. The restriction of the color visual fields may differentiate hysteria from other diseases. The hysterical child may be suggestible both positively and negatively, he may accept the suggestions given him for diagnostic purposes, or he may accept the opposite idea. If it is suggested to him that he likes to walk, he may walk vigorously, or he may refuse to walk so strenuously that he will not arise in the morning until he is compelled.

Habit spasm occasionally resembles chorea. Habit spasm is subject to the control of the will temporarily. The hysterical child with habit spasm may present difficulty in diagnosis.

Huntington's chorea does not occur in childhood, and recovery is not to be expected in that disease.

Chorea electrica resembles chorea most in the name. The movements in chorea electrica are extremely sudden, resembling the muscular contractions caused by an electric shock.

Irregular movements, due to timidity or embarrassment, are often found in shy children. These may be exaggerated by a visit to a strange place. The treating table and other equipment of an osteopathic office may frighten such a child and thus the irregular muscular contractions be emphasized.

Cerebral infantile paralysis may be associated with irregular movements. Hemichorea is most often confused with this paralysis. Other symptoms of organic brain lesion are usually present in paralysis. Choreic movements occurring during the first year of life are probably always due to cerebral hemorrhage.

Poliomyelitis may present difficulty, especially with the chorea without marked movements and with marked muscular weakness.

The electrical reaction of degeneration is present in poliomyelitis, and the reflexes are absent.

**Treatment.** The correction of the upper cervical lesions is of first importance. This alone has immediately terminated the movements in many cases. Usually a longer time is required for recovery. The other lesions, as found, should be corrected as soon as this is possible, under the peculiar conditions. Especial attention is required for the elimination of every structural condition which might interfere with the normal discharge of the blood and lymph from the skull. At first daily treatments are required. When some improvement is found, they may be given less frequently.

Rest in bed is indicated for every child with chorea, until there is noted some definite improvement. Older children who seem to be in fairly good health may then be allowed to be around the house, but no excitement or strenuous play should be permitted until the symptoms have entirely disappeared. For two years the child should be protected from over-exertion or excitement.

Parents must be told that the condition is really a serious one, and that the greatest care is necessary to prevent most regrettable complications. They must protect the child from all adverse circumstances, and must keep him from school until the last symptoms have disappeared. Association with other children may be harmful, since there is such a tendency for them to deride and ridicule their unfortunate associate. Older people should be always present when a choreic child plays with other children.

Isolation may cause fretting, and is not generally desirable.

Punishments, scoldings and ridicule are very harmful in these cases. Any embarrassment, shame or strong emotion of any kind tends to increase the severity of the jerking. Rewards are of no great harm, but are useless; the child is unable to control the muscles, and no volition of his brings about any good result.

The diet must be carefully determined. Meat, tea, coffee, and rich foods of any kind should be prohibited. Excess of starches or sugars, and especially candy, must be avoided. Milk is probably the best diet, and it may be advantageous to put the child in bed, on an exclusively milk diet, for three or four weeks. The use of the milk diet is difficult, and a good nurse is essential to a successful outcome. Vegetables and fruits are to be given freely. The juices of vegetables and fruits may be given in plentiful supply, diluted if this seems desirable on account of the age or the digestion of the child. Water must be given very freely; if it is necessary it may be flavored with fruit juice. At least six pints of liquid should be given daily to a child ten years old, with chorea.

If it is possible, the child should spend much time in the open air. A sleeping porch is excellent during the day and night. Daily warm

baths should be given; the child may remain in the tub of warm water from ten minutes to an hour, if it is comfortable. The movements usually cease during a warm bath.

Massage of the affected muscles is useful in some cases. If massage seems to increase the irritability of the child or to render the movements more severe it should be discontinued.

In every case of chorea, even the mildest, the heart should be watched constantly. The severity of the chorea is no measure of the severity of the cardiac disease. At the first development of a murmur the child should be put to bed, kept very quiet, and the treatment outlined for heart disease be given.

Severe cases require great care. The limbs should be bandaged to prevent injury to the skin, if the movements are very violent. A water bed or an air mattress is essential to the comfort of the patient who is subject to violent movements. The sides of the bedstead may be well padded, to prevent injury. In some cases it is necessary to bandage the limbs and fasten them to the bed, to restrain the violence of the jerking. This gives the patient a sense of comfort, though he may be too stuporous to realize that the limbs are restrained at all.

After the symptoms have passed away, and the child seems strong and well, he must still be protected from over-exertion or excitement for two months, at least. After this he may return to school and engage in ordinary sports, but he must not be subjected to any strenuous experiences until at least two years have passed.

He should be examined at monthly intervals for two years, and lesions quickly corrected.

**Prognosis.** Chorea is not often fatal, in itself. Very severe attacks may cause death, but these are rare. Relapse is not common, but recurrences are frequent. These usually occur during the spring following the first attack, and attacks occasionally occur every spring for four or five years.

## CHAPTER LXXI

### MISCELLAENOUS FUNCTIONAL NEUROSES

Several neurotic symptoms occur during childhood which are not associated with definite lesions within the central nervous system, and which may be due to any one or more of a number of etiological factors.

#### MOTOR PHENOMENA

A number of disorders of children are characterized by motor phenomena which are irregular in character, are somewhat co-ordinated or else bear no relation to any normal action.

In all of these disorders it is impossible to determine any definite pathology responsible for the disorder, and even the localization of nerve centers whose functions are disturbed is usually impossible.

Cervical lesions are invariably present in these children, and the etiological value of these lesions is indicated by the frequency with which the symptoms diminish, in some children, after the correction of the lesions. These are not of first importance, however, since very many children suffer from such lesions and very few suffer from the peculiar motor symptoms mentioned in this chapter. It is true also that in some cases the correction of the lesions is followed by slight improvement in the nervous conditions, though usually the general nervousness is always somewhat diminished.

All other conditions supposed to be causative of these peculiar motor disturbances are found in other children who yet fail to develop any serious motor abnormality.

#### Impulsive Tic

(General Tic; Gilles de Tourette's Disease)

This is a disease characterized by many complicated movements, usually associated with involuntary speech.

**Etiology.** The cause is unknown. It occurs in neurotic children, usually just before puberty. Bony lesions are abundant. The orbicularis palpebrae is most commonly first affected, and uncontrollable winking results. Convulsive twitchings of the muscles of the face, limbs and body follow, and these may be extremely violent. During these spasms the child usually cries aloud or shrieks, perhaps using words heard just before the onset of the spasms (echolalia); perhaps imitating the cry of a crow, the bark of a dog or the lowing of a cow; perhaps speaking words foul or profane (coprolalia). Hissing sounds are often caused. In other cases, instead of a definite convulsive attack, the child is compelled to count to a certain number, to touch some particular object, perhaps a certain number of



times, to speak aloud some series of words or to perform some other equally irrelevant act.

The disease is usually very persistent but usually disappears by the time the patient has reached full physical development.

**Treatment** is that of nervous children in general, plus certain other methods adapted to the condition. It is necessary that the child be taught self-control in every kindly manner that can be used. He must not be subjected to punishments, since they invariably make the child more nervous and less able to control himself. The source of the words he uses should be traced, if this is possible. Occasionally in tracing this element some primary cause of the spasms can be found. In many cases a well-judged and sensible course in psychoanalysis brings complete recovery. Since the exaggeration of the original sex-idea of the complexes has been recognized, psychoanalysis is able to give service in many cases to which it was originally not adapted.

**Prognosis.** The outlook is always serious. If the primary cause of the attacks can be found and removed, and if the general health can be improved, recovery is complete and permanent. In most cases this is not possible, and the child remains nervous and subject to various attacks of spasms and hysterical symptoms all his life.

### Habit Spasm

(Habit Tic; Simple Tic; Habit Chorea; Palmus)

Habit spasms are frequently noted in neurotic children. They originate in a voluntary, emotional or impulsive movement which is either performed under emotional stress or is repeatedly initiated by repetitions of the same stimulus.

The spasms usually begin between the ages of five and fifteen years, but they may begin earlier than this, or at any time of later life.

Local irritations may promote them. The first movement may be an attempt to relieve this irritation, and the persistence of the irritating focus perpetuates the movements until they become almost constant.

Adenoids are common in these children.

Habit alone may cause the condition in nervous children. A boy who has learned, after much practice, to move his ears often continues to move them at intervals without intending to do so or even being conscious that he is performing that delightful action. The girl whose hair is bound too tightly may begin to wrinkle the forehead. The child whose clothing is ill-fitting or too tight may begin to shrug the shoulders in an effort to secure a more comfortable position. The movements then usually persist, though new clothing may be perfectly comfortable. The incorrect vision due to ocular imperfections, may initiate blinking.

The movement may begin as a voluntary expression of disrespect for some person greatly disliked; the grimaces, first made in strict privacy, soon become involuntary. The initiation of these movements is due to almost as many causes as are the children affected. Very often no definite cause of the particular spasm can be found or imagined. Occasionally, in older children, some of the methods of psychoanalysis uncover the original cause. The child is able to control the spasms temporarily. They are greatly increased under any emotional strain.

Differential diagnosis is not often difficult. The facial spasms may suggest chorea, but the other symptoms of chorea are absent. Other spasmodic disorders are usually easily differentiated from habit spasm by the character of the movements.

**Treatment.** The general health of the child should be improved as soon as this is possible. Vertebral lesions and rib lesions are usually many, in these children, and should be corrected. A very important factor in treatment is to make the child become conscious of the movement. This usually makes him worse, at first. Next, he must become able to perform the movement voluntarily. Having become able to accomplish the movement, thus securing volitional control over the muscles involved, he is able to refrain from that movement. Recovery is then complete. Recurrence is to be expected if the original cause is permitted to remain.

**Prognosis.** With correct treatment the spasms usually disappear within a few weeks. Without treatment they may persist until puberty, rarely later. While they persist they increase the nervousness of the child. With improper treatment they may be perpetuated and made more severe.

### Nodding Spasm

(Spasmus Nutans; Gyrospasm)

This is a disease rarely found in America, and it most commonly occurs in the children of immigrants.

**Etiology.** Rickets is a predisposing factor. Lesions of the occiput and the upper cervical vertebra are invariably present, but it is not usually possible to determine whether these preceded or followed the nodding.

Darkness of the rooms where those children are kept seems to be important in etiology. The child, already poorly nourished and neurotic, moves the eyes and the head in continuous efforts to secure distinct vision. The head is often held retracted or with the midline of the face placed obliquely; this also may be due to the effort to secure distinct vision.

**Symptoms** first occur during the first year, rarely later, and very rarely in the second year. They include the peculiar nodding of

the head up and down, or rotation of the head from side to side. With the latter condition nystagmus is constant; when the baby nods, nystagmus is less constant. When the head is held quiet, the nystagmus increases. Convergent strabismus is occasionally associated with nystagmus.

The general health, usually subnormal before the onset of the head movements, is not affected. Mentality remains unchanged.

Differential diagnosis is not difficult. Rickety children rock the head back and forth on the pillow, but the character of the motion is quite different, being slower, less regular, and is associated with irritability. Eclampsia nutans and habitual nodding of the head occur only in older subjects. Congenital nystagmus is associated with ocular defect, and is not associated with nodding. No other disease shows the early onset (fifth to twelfth month), the associated nystagmus and head movements, and the almost invariable recovery.

**Treatment** includes the correction of such lesions as may be found, increasing the nutrition of the child and keeping him in a well-lighted room.

**Prognosis** is favorable. The movement disappear within two to four months, and no evil after effects are to be expected from the spasms. The primary condition of malnutrition may cloud the prognosis to some extent.

### Nystagmus

This involuntary movement of the eyeballs may be either vertical or horizontal and one or both eyes may be affected. The movements are repeated from fifty to two hundred times each minute.

Functional nystagmus may be associated with nodding spasm, as a neurosis with malnutrition, hysteria, gastrointestinal diseases, as a result of any focus of irritation in the body, and in many other conditions. In these reflex or toxic forms the nystagmus is of temporary duration, and disappears very promptly on removal of the causes.

Nystagmus is more often a symptom of organic disease of the eye or of the central nervous system. Blindness in one eye, hydrocephalus, disseminated sclerosis, Friedreich's ataxia, brain tumor and many other diseases of the nervous system may cause nystagmus.

Treatment is that of the primary condition.

Prognosis is excellent for recovery in functional nystagmus. In that due to organic diseases the prognosis is that of the primary disease.

### Athetoid Movements

Athetosis is a chronic spasm, most commonly affecting the hands and arms, but occasionally affecting the feet, legs and face. Athetosis is most commonly unilateral, but may be bilateral. It is most

common after cerebral paralysis due to encephalitis or to cerebral hemorrhage, but may be due to almost any lesion of the basal ganglia or other cerebral centers.

The movements are very slow and the muscles affected have increased tone. The fingers are extended on the hand, and usually remain straight. The thumb is strongly adducted. The arms become extended with a peculiar tense, flowing movement. These movements, once seen, are not easily forgotten. In certain forms of epilepsy there may be an aura of athetoid movements, or these may initiate the epileptic fit.

Prognosis in these cases is very gloomy. If the cause can be removed, recovery may occur.

Athetoid movements may occur in children who are neurotic or even those apparently healthy. They always indicate a neurotic tendency, and they cloud the prognosis of any condition in which they occur.

## HICCOUGH

(Singultus)

This is a spasm of the diaphragm, which causes an uncomfortable sensation. It occurs without annoyance in babies who have had too large a meal. Swallowing air may cause very annoying hiccough, and this is most commonly noted in neurotic or hysterical children.

Lesions of the third cervical and the third thoracic vertebra, and of any one of the upper ribs, have been found responsible for hiccough in children able to run around, as in older persons. Rarely it is a symptom of impending death or of serious nervous disease.

Correction of the lesions as found may stop the hiccough immediately. Correction of abnormal habitual or environmental conditions results in relief when these are responsible for the hiccough.

A mild, steady pressure over the phrenic nerve in the neck, pressure over the muscles which are contracted in the neck or the spinal column, and steady pressure over the pit of the stomach are some of the palliative methods. Drinking cold water or hot water sometimes relieves the attack. Children may be taught to hold the breath for the times of several respirations; this sometimes gives relief. Forced expiration followed by apnea is also occasionally useful. Anything which suddenly distracts the child's attention may cause the spasms to cease immediately.

Prognosis is bright for the usual cases of hiccough. When these spasms occur in very sick children they indicate approaching dissolution.



## DISORDERS OF SPEECH.

The normal child begins to try to talk during the first year, and he should be able to express his wants and his ideas by the end of the third year. He tries to talk through imitation and as a result of the training of his parents or older children.

### Mutism

(Aphasia; Dumbness; Absence of Speech)

In this condition the child does not learn to talk. He may learn to speak a few words and to use them with a fair degree of accuracy, but he does not learn to express himself in speech.

Occasionally the child is perfectly able to talk, and he may even practice talking when no one can hear him. He develops an obstinacy concerning speech, and cannot will himself to talk. These cases may be recognized by accidentally overhearing him practice when he thinks himself alone, or he may talk in his sleep and thus be caught. Not rarely a physician's examination shows the normal condition of the apparatus of articulation and of the brain centers, and the child is then able to speak normally. Dr. Georgia Steunenberg reports such a case. The child was perfectly able to speak at the time of the examination. When she explained the matter to the mother in the presence of the child he expressed profanely his opinion of her ability. He talked normally and profusely from that time for the rest of his life.

Sometimes these children overcome the obstinacy, which is probably a form of negative suggestibility, by beginning to speak gradually; sometimes they overhear a statement as to their inability to speak and then begin to talk as the result of the negative reaction to this suggestion.

Congenital deafness or deafness acquired before the child has begun to try to talk causes deaf-mutism. These children can be taught to talk by the methods employed in schools for the deaf. Deformities of the tongue and the larynx may so interfere with speech that only inarticulate sounds can be produced. Idiots and low-grade imbeciles are often unable to learn to talk.

**Organic aphasia** is usually due to brain lesions, and may be caused by trauma, cerebral hemorrhage, syphilis, encephalitis, brain tumor or some other cause of brain injury.

**Functional aphasia** is usually temporary and is associated with chorea, hysteria, migraine, emotional shock or severe pain, and is not uncommon as a sequel of typhoid or other infectious diseases and high fevers.

**Sensory aphasia** is due to the fact that the child cannot understand spoken words. He may be able to understand and therefore to speak a few words. It is very rare in children, and is probably

due to some brain lesion. Occasionally the condition passes away in a few months or a few years, in which case there may have been simply a retarded development of certain areas of the brain.

**Alexia** (Congenital word blindness), or the inability to understand written or printed words, is also rare in children. The child is really intelligent, though he may not seem so in school, his sight is normal and he can hear spoken words and can talk normally. The disorder may prevent him from learning to read or to write, but may not affect his power to draw or to paint. In less serious cases his power of reading and writing may be retarded to some extent.

In all these forms of aphasia, it may be difficult to distinguish between organic disease of the brain and retardation or functional disorder. In any case the treatment includes, first, the removal or correction of any cause of nervous disorder that can be found, and wisely judged educational measures.

The prognosis depends upon the cause. Hysterical aphasia disappears in time. Organic aphasia is usually incurable. Functional aphasia may or may not be incurable, according to the conditions responsible for the speech disorder. Alexia is usually persistent, but may disappear with correct training.

### Imperfect Speech

(Stammering; Stuttering; Lalling; Lispings; Idioglossia; Alalia)

Imperfect formation of words is due to imperfect structure of the articulating mechanism or to inco-ordination of the respiratory and the articulating systems. Several types are found.

**Stuttering** is a speech disorder in which there is difficulty in beginning any word, or words which begin with some particular letter or letters. The child forms the initial sound with great difficulty, repeating the sound and often shrugging the shoulders, making violent grimaces and showing evidences of emotional disturbances. Less severe cases show only difficulty in forming the initial sound, and are able to talk intelligibly despite the slight impediment.

**Stammering** is an inability to form certain words or sounds, is often associated with defect of the organs of speech, and is found in many children who are mentally defective. The terms are often used interchangeably.

In both stammering and stuttering emotional states may greatly exaggerate the defect. The loss of self-consciousness may cause it to disappear altogether. Many of these unfortunates can sing, whistle, utter the words necessary in playing ball or any other somewhat exciting game. In a few cases the individual can pray aloud or can swear in anger without difficulty.

**Lispings** is characterized by inability to form certain sounds and the substitution of sounds more easily formed for them. The most

common is the substitution of the sound "th" for the sound "s". The sounds of "g", "r" and "k" are also sometimes formed with difficulty and other, easier sounds substituted for them. The child often substitutes easier sounds as he learns to talk, since the more difficult sounds are impossible, but he normally outgrows the custom as he learns to form the difficult ones.

Organic causes of lisping are found, such as hare-lip, cleft palate and paralysis of the lips.

**Lalling** (baby-talk) is a persistence of the immature speech of a baby learning to talk. It is present in children mentally deficient, and in those who have been incorrectly taught. It sometimes occurs that an only child is so praised for his first efforts to talk, and these are answered by maternal "baby-talk" until he becomes habituated to the infantile customs.

**Alalia** is an exaggerated and more immature form of lalling. The child is unable to articulate any word distinctly and he may be able to articulate at all. The sounds which a baby makes in early infancy are those of alalia.

**Idioglossia** is aggravated lalling. The child substitutes easier sounds for so many others that speech is voluble but unintelligible. The child may be mentally normal and the flow of speech sounds normal, but no word can be distinguished.

### Etiology

Heredity is often important, but it is almost always associated with imitation. Heredity of some nervous disorder is common in those cases in which heredity of speech defect is not present.

Imitation is a very common cause of speech defect. The child learns to talk by imitation, and if the other members of the family speak incorrectly the child is forced to learn the imperfect speech.

Adenoids and other obstructions to the respiratory passages prevent distinct enunciation in all children. Nervous children may add various nervous habits to imperfect speech due to the respiratory impediment.

Improper training is an important factor in the etiology of bad habits of speech.

Secretiveness, timidity and a sense of shame are responsible for certain forms of stammering. Children who masturbate and who are not mentally deficient nearly always display some speech defect.

Mild degrees of hare-lip and cleft palate cause defective speech. More severe cases may prevent speech altogether.

Cerebral lesions may cause imperfect speech as such lesions cause inco-ordination of other complicated and delicate actions.

### Treatment

The physical condition of the child should be made as nearly normal as possible. Nervous children should receive the treatment advised for them; defects such as hare-lip and cleft palate require surgical treatment.

Educational measures are of prime importance. The other members of the family must co-operate in these if the child is to attain normal speech with the greatest possible speed. Rewards are usually very successful. The rule that questions are not to be answered and that no one will accede to a request until the question has been properly spoken can easily be made a cruel rule, but if it is properly enforced it is very useful.

Punishments are harmful and cruel. Anything which causes grief or rebellion interferes with the development of delicate co-ordinations of any kind, and such discipline as is necessary must be well-judged if the child is ever to develop normal speech.

Prognosis. Organic causes may completely prevent the development of proper enunciation.

Nearly all cases yield to proper treatment, and the child with normal mentality becomes able to talk distinctly.

### HEADACHE

Almost all infectious diseases are associated with headache. Little children and babies do not seem able to localize the pain, and they are merely fretful and uncomfortable. In the acute pain due to earache or localized severe pain, the child may indicate its location by holding the hand over the painful area.

The brain itself is not sensitive; the pain is usually due to meningeal disturbance.

The different types of headache are due to various causes.

### Types

**Lesions.** Headache due to cervical or occipital lesions is dull and throbbing and is associated with marked irritability and often a mental dullness. The pain is occipital or suboccipital in most cases, but may be frontal.

Organic disease of the brain causes varying degrees of headache; probably not until the meninges are affected.

Brain tumor, syphilis, tubercle, and any infection of the brain and meninges or the sinuses of the skull may cause headaches of varying severity but usually localized if the child is old enough to realize any location of pain.

Infectious or febrile diseases cause a headache which is commonly frontal and which persists for a few hours only.



**Toxic headache** is due to the presence of toxic substances in the blood stream. The opiates, alcoholic drugs and the antipyretic drugs are still occasionally given to children by ignorant mothers or by lazy nurses. The headache which results from these drugs is dull, severe, persistent and often associated with dull uncomfortable stupor. Large doses may bring unconsciousness. Excess of carbon dioxide is fairly common, but rarely is sufficient to cause headache. Carbon monoxide may be permitted to reach the air of a room from a hot stove in which a considerable amount of fuel is burning slowly. This causes an annoying and persistent headache and an anemia which may be severe.

Hyperglycemia is often the cause of toxic headache. This headache may be due to autogenic or retained toxins. Gastrointestinal disorders, especially constipation and diarrhea may cause such a headache. It may be difficult to distinguish between the headache caused by indigestion and a "bilious attack" and the headache which is the serious symptom of migraine.

Headache due to toxemia of any kind is usually frontal or vertical, and other symptoms of toxemia may be found on examination.

Uremic headache is a form of toxic headache. It may be due to almost any disorder. Usually other symptoms of uremia are found, but this is not always the case. The pain is occipital in most cases. Rarely this headache is frontal.

Nervous headache is often present among nervous children, and is very common among neurasthenic, hysterical or epileptic children. It may disappear for a day or so, but is extremely persistent in returning. Fatigue of body or mind, emotional stresses, and marked reluctance to perform any certain duty increases the pain. "School headache" and "Sunday headache" may be of this type, but are more commonly due to abnormal conditions of the eyes or the ears.

**Circulatory headache** may be either anemic or ischemic, or it may be congestive. Anemia causes a dull, vertical or frontal, persistent headache. Hyperemia may be due to pertussis and coughing, disease of the heart, impending menstruation, or exposure to heat. Great mental effort may also cause a congestive headache, but this is commonly associated with constipation. The face is flushed and eyes suffused and red in this headache. It is usually vertical but may be frontal.

Eye-strain causes many headaches. Astigmatism and hyperopia are most commonly responsible for eye-strain. Normal eyes may be strained if the child tries to read in dim light or in a bright glare, or if he sits in such a position as to bring tension upon the cervical muscles, or if he reads or studies for too long a time. The pain is occipital or frontal; rarely temporal.

Otitis media may cause a severe headache, the cause of which is found with difficulty. The pain is parietal or temporal.

Adenoids, rhinitis or nasal polyps cause a dull, sometimes throbbing headache which may not be localizable, but may be very severe at the root of the nose and in the lower frontal area.

**Migraine** (sick headache; hemicrania) presents the symptoms found in adults. It is usually directly hereditary and may persist for generations. Gouty or neurotic heredity may be found in many cases in which direct inheritance is not to be found. Girls suffer more often than boys, and the disease is usually transmitted along the female line. There seems to be a persistent predisposition, and the attacks are precipitated by fatigue, emotional storms, or indigestion. Often the attack occurs with recognizable cause. They may be definitely periodical, but this is less during childhood than during adult life.

The attacks begin with vertigo, photophobia, swimming, bright lights before the eyes, crackling sounds, peculiar sensations of odors, paresthesias or speech difficulties. The headache, almost invariably unilateral, follows the prodromal symptoms by a few minutes or an hour or more. Vomiting follows the headache in most cases, and this may be extremely severe. The pain may diminish with the occurrence of vomiting, but in many cases the pain persists unmodified. After a few hours or a day the child passes into a deep sleep of fatigue and awakens weak, but without pain.

Recurrent vomiting in childhood may be followed by migraine in later childhood or adult life.

The definite diagnosis of headache is often very difficult. Generally speaking, localized persistent headache is most common in organic disease of the brain. Temporary headache with fever is most commonly due to gastro-intestinal disease, or precedes some infectious disease. Periodic headache is most commonly due to migraine, but may be due to gastro-intestinal disorders due to periodical eating of improper foods (Monday headache after a too-hearty Sunday dinner), or to eye-strain due to periodical over-use of the eyes (monthly examinations).

Frontal headache is most commonly due to eye-strain, disease of the nasal passages, anemia or gastro-intestinal disorders. Parietal or temporal headache may be due to otitis, migraine or occipital lesion. Vertical headache is usually due to nervous states or to anemia. Occipital headache may be due to abnormal conditions of the eyes or the ears, or to pharyngitis, but is most commonly due to cervical or occipital lesions. All of these statements are made upon averages, and in any case the relations as given may be absent.

**Treatment** varies. In any case correction of the occipital and upper cervical lesions are present and should be corrected. Other

lesions are to be found according to the type of the headache and the general condition of the child. All should be corrected, of course.

Anemia may be present in any case, as may also nephritis. The blood and the urine should be examined in every case. Hyperglycemia may be shown by the chemical analysis of the blood when there is no other symptom of its presence. The treatment, in these cases, must include proper dietetic measures.

Constipation must be relieved; it is usually present when a child has any type of headache.

At the time of an acute attack, rest in bed is indicated. Hot applications relieve some headaches; cold applications are more comfortable in others, without much regard to the cause of the pain or its type. A hot foot bath often gives relief, especially in the congestive headaches. The room should be darkened and very quiet.

The application of counter-irritants to the forehead or the back of the neck often give relief; the vinegar and red pepper of ancient fame; mustard plasters; menthol, cologne and anything else which causes irritation of the sensory nerves of the forehead or the back of the neck may give relief. Hysterical headaches are often relieved by a gentle, rhythmical rubbing of the forehead (This is especially true if the person doing the rubbing is greatly loved by the patient. The mother's hands are famous for this ministration).

In every case the eyes should be examined, in order that any refractive error may be corrected. The lighting of the home and the school room should be investigated.

### DISORDERS OF SLEEP

Sleep is the primary condition of life; wakefulness is the more advanced state. The new-born baby sleeps practically all the time, and for the first few weeks he sleeps twenty-three hours each day. As life goes on, the time of wakefulness increases at the expense of the time of sleep. In little babies, the time of wakefulness is probably not a time of definite consciousness, but is merely a time of activity, a time of feeding and of exercising the limbs and the other muscles of the body. These activities are mediated by the lower nerve centers since the cerebral centers have not yet become sufficiently developed to permit their functional activity.

The condition of the brain during sleep has been the subject of much discussion and of some experiment. It is not possible to say just what changes do occur which determine whether sleep or wakefulness is present at any one time. We do know that abnormal circulatory conditions, toxemia and almost any diseased condition of the brain or other parts of the body exercise detrimental effects upon the relations of sleep and wakefulness.

### Excessive Sleepiness

This condition is to be differentiated from stupor and coma by the fact that these more serious conditions are associated with other evidences of disease. Meningitis, organic disease of the brain, the onset of acute infectious diseases and uremia are common causes of sleepiness which is temporary and is soon followed by the development of other symptoms. After drugs have been given, especially the bromides, paragoric and other opiates and after an epileptic attack a period of sleepiness is to be expected.

Weakly babies and delicate older children may be sleepy for a greater part of each day than are normal children, and this is an excellent thing for them. Anemic, debilitated and toxic children are rather stupid all the time, and tend to sleep more than do normal children.

A sleepiness which is usually associated with a mild, constant, dull headache in the occipital region is very frequently due to lesions of the occiput or the atlas and axis.

Lesions of the lower thoracic region may cause slight hyperemia of the abdominal organs, and thus leave the brain ischemic. This condition may be associated with sleepiness, or there may be abnormal wakefulness for a time, followed by sleepiness.

The treatment in all of these abnormal conditions is evident. The causes must be removed, and the child then regains normal sleep-waking relations. In all cases, the correction of such lesions as may be found is an important factor in hastening recovery and in preventing recurrence.

**Prognosis.** If the cause can be removed the abnormal condition passes away without any abnormal sequelae. If the sleepy condition persists too long there may be some slight mental retardation, but this is not persistent. If the cause is some organic disease which cannot be removed or which at least persists for any considerable time, the effects produced upon the mental development of the child may be very serious.

### Deficient or Disturbed Sleep; Insomnia

Deficient sleep may be due to the onset of some febrile state, or may be due to physical discomfort of any other kind. Digestive disorders often cause wakefulness. The acute pain of colic, the dull discomfort due to the presence of feces in the rectum, the discomfort of nausea and the presence of gas in the bowels are all common causes of disturbed sleep. The child may lie awake, restless and fretful, or may awaken frequently with screaming or with fretfulness.

Nervousness is a cause of wakefulness in children predisposed. It is common for the child who has been excited and playful to lie



awake, often in a perfectly good humor, for some hours after being put to bed.

Nervous children often suffer from fright. The nervous child may be terrified when first placed in a room alone, and this terror may cause restlessness or insomnia which persists for weeks or months.

Physical discomfort may be due to any one of a long list of conditions. Wet clothing, eczema, intertrigo, too much covering, too little covering, excessive heat or chilliness, wrinkled sheets or wrinkled night-dress, a bed too soft, too hard, too uneven, too much heavy clothing, hunger, overfeeding, excessive light, darkness in the case of a frightened child, noise, poor air and many other factors of discomfort are common causes of disturbed sleep. Adenoids or other causes of respiratory impediment are also causes for disturbed sleep.

Lesions of the lower cervical and the upper thoracic vertebra, the first rib and the clavicle are common causes of sleeplessness. The most careful care of the child cannot encourage normal sleep if these lesions are present.

Dreaming causes no ill effects if the dreams reflect the day's occurrences or the ordinary wishes of childhood. Probably all children dream during sleep, though they usually forget the dreams on waking, as is normal. Some movements of the limbs or the lips, or dim speaking suggests that these dreams are very common, even in the sleep of little babies.

Respiratory impediment and indigestion are very common causes of bad dreams and nightmares. The frights of a day may be suggested by the bad dreams of many successive nights. Bad dreams which cause the child to awaken struggling or screaming are nightmares. Reflex irritation such as adherent prepuce or clitoris, or eye-strain, are also fairly common causes of nightmare.

**Night terrors** (*pavor nocturnus*) are still more serious than are nightmares. These are especially common between the ages of three years and ten years. They are due to nervousness associated with adenoids, heart disease, gastrointestinal disorders or emotional storms during the preceding day or two. Symptomatic night terrors are really nightmares, that is, the shrieking or struggling results of a bad dream. The child is usually able to remember some elements of the dream which has frightened him.

Cerebral or idiopathic night terror is much more severe. The child awakens shrieking after an hour or two of apparently normal sleep. He may point at some article with which he has associated the terrible fear which he suffers, but he cannot remember any dream elements. He clutches the nurse or his mother, but does not seem comforted by her presence. Sometimes fifteen minutes or half

an hour pass before he can be comforted. He may go to sleep again without becoming really awake, and he does not remember anything of the occurrence the next day. Urine may be voided voluntarily during the attack. They most commonly occur while the bladder is full. The attacks may be so mild as to resemble bad dreams or nightmares, or they may be so severe as to lead to the suspicion that they are really epileptic.

**Day terrors** (*pavor diurnus*) are much less common than are night terrors. They may occur during sleep, in the early morning, or they may occur during the day, while the child is awake. He suddenly becomes terrified and rushes to his mother shrieking. He cannot be comforted for some minutes, or even half an hour and may cry for a long time after the fright has passed away. His behavior suggests that some hallucination or illusion is responsible for the fright. Ocular disturbances may cause him to see some harmless object as very large and overwhelming, or to see motion in an object ordinarily still. For example, one child saw a house as if it were falling over upon him.

Day terrors suggest epilepsy, hysteria and insanity, but may be merely functional and transitory disturbances.

Little babies and young run-abouts often shriek suddenly and for some minutes. It may be difficult to distinguish between day terrors and the shrieking due to anger or disappointment. The day terrors occur occasionally when no cause for anger or disappointment can be found, but they may occasionally be induced by the grief or fear of the child, and yet be truly day terrors.

### MENTAL RETARDATION

Babies who are frequently very ill, or who suffer from any long and wasting disease are apt to show retarded development. The baby may remain for a few weeks or months at the same weight. He learns to sit alone, to stand or to walk some months, or even a year or two, later than is the case with other members of the same family. The mental development is also retarded. He does not learn to use his hands, to initiate motions or to talk until a considerable time after he would normally attain that stage of development.

After the cause of the physical weakness has passed away, the body begins to gain in weight and strength, but the mental state persists for some weeks or even several years afterward. The longer the time of mental retardation after the physical improvement, the more gloomy is the prognosis for the attainment of normal mentality at any time. In most cases the mental development lags only a few weeks behind the physical, and the child ultimately attains almost or quite normal mentality by the time adult life is reached.

During the intervening years he is always somewhat behind his normal associates of the same age, but he tends to diminish the mental distances between them constantly. In many cases these children surpass their brothers or sisters who began school life without any handicap.

Not rarely a child supposed to be of subnormal mentality during childhood develops into an adult of remarkable attainments. In those cases in which the ultimate development is unbalanced, showing remarkable ability along certain lines only, it is probable that the childish state is really one of mental retardation.

In many cases the childish condition is not truly a retardation but merely some childish peculiarity, some unwise training, or the result of some misunderstanding on the part of the parents or teachers.

## CHAPTER LXXII

### PARALYSES DUE TO CEREBRAL HEMORRHAGE

(Spastic Paraplegia, Diplegia or Hemiplegia; Cerebral Diplegia; Little's Disease; Infantile Cerebral Paralysis)

The results of cerebral hemorrhage occurring during birth have been considered with other noninfectious diseases of the newly born. The paralyses resulting from birth hemorrhages, acquired hemorrhages in early life and the cerebral defects probably resulting from intrauterine cerebral hemorrhage present no important variations.

Cerebral hemorrhages of small extent may cause no abnormal symptoms at any time of life. Syphilis and other infections predispose to birth hemorrhages. Injuries, especially a blow upon the abdomen of the mother before labor begins, occasionally cause hemorrhage upon the brain of the baby; this may result immediately from the injury or may be delayed until the peculiar and difficult pressure conditions of birth.

Tedious labor, improperly applied forceps, premature births, and breech presentations with difficulty in extracting the head are the most common causes of cerebral hemorrhage during birth.

Trauma is the most common cause of intracranial hemorrhage occurring after birth. During the first five years of life comparatively slight traumatic factors may result in hemorrhage into the subdural space. Such hemorrhages should be suspected when a child of five or six years, or less, remains unconscious more than a few minutes after a blow on the head or a fall or other accident.

Pachymeningitis, thrombosis of the superior longitudinal sinus, embolism from cardiac vegetations, and the cerebral hyperemia resulting from hard coughing, as in pertussis are other causes of postnatal cerebral hemorrhage.

Arteriosclerosis, the most common cause of cerebral hemorrhage in adults, is not present in children, and this accounts for the great rarity of hemorrhages into the internal capsule and the lateral ventricles in children.

**Tissue changes.** The amount of blood varies from that barely recognizable to sixty cubic centimeters or more. The small, and probably harmless, hemorrhages cause a slight staining of the meninges but no other manifestations of their presence. Somewhat larger, multiple hemorrhages are sometimes scattered over the convexity. The brain is usually edematous, and if the condition is marked, serious mental defect usually follows. Large hemorrhages upon the convexity usually comes from the superior longitudinal sinus and the veins which drain into it; these veins may be injured by the parietal bones during the moulding of birth. These are usually bilateral, though one side may be more seriously involved. Gravity accounts for the diffusion of the blood, which may cover the entire brain. Hemorrhages may occur above



the cerebellum, and are usually below the tentorium, which is usually ruptured. Some of the blood may be found above the cerebellum. This is most often due to lateral compression of the head. Hemorrhage into the ventricles is due to venous congestion, and is rare. Rupture of the vein of Galen or the straight sinus causes this type, which is always immediately fatal. Hemorrhages between the dura and the skull occur only when the skull is fractured. Hemorrhages into the medulla and the upper part of the spinal cord are probably always fatal. Coincident hemorrhages into the lungs and other viscera are often found in fatal cerebral hemorrhages.

In stillborn children or those whose death occurs within one or two days after birth the blood is partly fluid. Later the blood is coagulated completely and may be partly absorbed or organized. When the hemorrhage is large the brain may show softening. These cases are probably always fatal within a few days.

Cerebral paralysis is nearly always due to meningeal rather than cerebral hemorrhages. The blood is usually found between the arachnoid and the pia, which exerts little or no protection to the brain. The brain is nearly always injured to some extent by definite hemorrhage. Very rarely the hemorrhage may be from a cerebral vein, or the brain itself be injured by fractured bones of the skull.

Spinal paralyzes are very rare. The hemorrhages may be meningeal or from the vessels of the cord itself.

Facial paralysis and paralysis of the arms are due to pressure, from forceps or from delayed labor when there is pressure made by the maternal sacrum or ischium. Paralysis of the legs, other than the rare cases due to spinal hemorrhage, is never due to the accidents of birth.

**Diagnosis.** The early symptoms of postnatal cerebral hemorrhage may be so slight as to escape attention. During the night slight convulsive attacks or syncope are not noticed. If the hemorrhage is due to trauma a period of unconsciousness follows the fall. With returning consciousness there may or may not be convulsions, but in nearly all cases convulsions occur within a few days or a few weeks after the cerebral insult. The time of the convulsions depends upon the extent and location of the hemorrhage, and the speed with which the blood becomes coagulated, undergoes fibrinolysis, cytolysis and absorption, or becomes organized, and upon the amount of injury to the brain tissue which results from the hemorrhage.

When the trauma is due to coughing, to thrombosis or embolism, or to pachymeningitis, or when the hemorrhages occur during the progress of some febrile disease the onset is most commonly with convulsions. These differ from the convulsions due to spasmophilia, toxemia or reflexes in their persistence. Cerebral convulsions usually last ten minutes to an hour, and may recur until a definitely eclamptic state is produced; this may last hours or until the child dies. The cerebral convulsion also displays, in almost every case, an irregular distribution of the convulsive movements; one side of the body, the lower limbs, the face, or a single limb may be more seriously involved, or may be involved first. This irregularity is itself diagnostic. Consciousness is completely lost during the convulsions, and may return during the intervals in mild cases, or may

not return during the short intervals in more serious cases. Unconsciousness may persist for some hours after the convulsions have ceased, in very severe cases. Twitchings of the limbs and pupillary contraction or dilatation are common; these suggest cortical irritation.

Fever is rarely present. During the course of an acute disease the temperature may be suddenly diminished by the occurrence of cerebral hemorrhage. Vomiting is common, and this may lead to an erroneous diagnosis of convulsions of gastrointestinal origin, especially when the convulsive seizures follow slight trauma.

After the convulsion ceases, and the child regains consciousness, there may be some aphasia, but this is less common than in adults with cerebral hemorrhage, and it passes away more rapidly in children. It may occur in children when the right or the left side of the body is paralyzed, thus also differing from that commonly found in adults.

In many cases the symptoms of the onset are so mild, or so greatly resemble the common maladies of childhood that the mother is unable to give any satisfactory account of the first symptoms.

Paralysis is the permanent effect of cerebral hemorrhage. This may be noticed before the first symptoms have subsided, or may not be noticed for some weeks afterward. This is usually hemiplegia, though when unusual cerebral areas are involved other paralyses may be found. Facial paralysis is usually present, but the upper branch of the facial nerve is not affected; the eyes can be closed and the brows raised. Diplegia and paraplegia are extremely rare effects of postnatal hemorrhages, and their presence is usually pathognomonic of birth or intrauterine hemorrhages.

The paralyzed limbs show increased tonicity, a certain degree of rigidity, and an exaggeration of the deep reflexes. Slight ankle clonus may or may not be present. The electrical reactions of the muscles remain normal. The sensation is not affected, usually, though there may be some slight sensory disturbance occasionally.

The paralysis diminishes after a week or two, and the child begins to use the affected limbs. The aphasia passes away within a few days. The lower limbs regain strength more rapidly than the upper limbs. If the child could walk before the attack, he usually regains that power within a few weeks, most commonly with a slight permanent lagging of the affected leg, but occasionally the paralysis disappears completely. It sometimes happens that some paralysis of the leg persists indefinitely. The arm recovers more slowly, perhaps because gravity causes the blood upon the cerebrum to flow over the arm centers. Permanent paralysis is more common in the arm than in the leg, in these cases. Improvement may persist, more and more slowly, for several years after the first symptoms.

When the paralysis persists in any member, contractures are to be expected. Any of the forms of talipes, various types of irregular rigidity, with a certain amount of atrophy of the affected limb is commonly found in persistent paralyses. Athetosis is rarely a sequel of acquired cerebral hemorrhage.

The sphincters are never involved. Epilepsy is rather common after cerebral hemorrhage, and during an epileptic attack the sphincters may be affected. The epilepsy is occasionally of the ordinary type, but more often is Jacksonian.

Mentality is not affected by cerebral hemorrhages occurring in children above one year old.

The differential diagnosis must consider meningitis, encephalitis, thrombosis, and, in children with heart lesions, embolism, if the patient is seen during the onset. Later, it may be impossible to determine whether an existent paralysis, with or without epilepsy, may have been due to hemorrhage or to some other cause of cerebral injury.

**Differential diagnosis.** Atypical cases occur, in which it is difficult or impossible to determine to which type the case belongs. The cerebral origin of the trouble is indicated by the spasticity, increased reflexes, slight atrophy, mental defects, the normal electrical reactions of the muscles and the development of athetoid or choreic movements, or of epilepsy. The presence of the Argyll-Robertson pupil strongly suggests syphilis. Choked disc suggests brain tumor. If the spasticity is slight Freidreich's ataxia may be suggested. Nystagmus, intention tremor and bradylalia with atypical distribution of the paralysis may suggest multiple sclerosis. Diffuse sclerosis and amaurotic idiocy may be suggested when the child is first seen in later childhood, without satisfactory history. All of these conditions are usually differentiated with ease if the history is definitely given and the symptoms as noted kept in mind.

### Types of Cerebral Paralysis

**Spastic infantile hemiplegias** (Unilateral cerebral paralysis of children) are usually postnatal, are often followed by epilepsy, athetoid or choreic movements and by disturbances in growth, and usually affect the arm more seriously than the leg. The facial muscles are usually affected, though not severely, and the facial paralysis may be barely discernible. Aphasia is present in the early stages of the paralysis. Mentality may not be affected, or may be slightly or very severely disturbed. The patellar reflex may be exaggerated upon the normal side, but the affected side gives the more marked exaggeration. Babinski's sign is commonly found upon the affected side. Contractures are usually most pronounced in the flexors and pronators of the arms and the flexors of the legs. These contractions produce rather a typical posture. The leg is

slightly flexed with internal rotation, and the foot twisted with the great toe turned inward and the heel turned outward; the foot is extended to its greatest extent by the contracture of the calf muscles. The position of the hand varies, but it is usually firmly fixed and pronated. The elbow makes about a right angle.

This spastic condition is associated with various involuntary movements. Occasional spasms without recognizable cause occur. Intention tremor is common, and this tremor may be very severe. Athetotic and choreic movements may be marked, and they usually are worst when the paralysis is least severe. Facial grimaces are often associated with the choreic and athetoid movements of the limbs, and may substitute for these. When the child is able to walk at all, the leg is thrown around from the hip, and the toes alone touch the ground. In milder cases the gait may seem normal, but the child is awkward when he jumps, stands on one foot, or tries to hop. A certain amount of trophic or growth defect is present in the affected limbs.

Mentality may be apparently unaffected, or the child may be idiotic or he may be emotionally unstable or show any intermediate degree of mental aberrancy.

Epilepsy occurs in about half the cases; it may be delayed until almost or quite the puberty years. The epileptic mentality is present in children who suffer from the epilepsy due to cerebral hemorrhage, as it is in idiopathic epilepsy.

Double spastic hemiplegia is characterized by these conditions affecting both sides.

**Choreic paralysis** (Choreic paresis) is a form of hemiplegia in which actual paralysis is not found, but in which choreic movements appear which resemble those associated with hemiplegia. The affected muscles are usually somewhat spastic, though this may not be easily recognizable.

**Cerebral diplegia** (Little's disease) includes those cases of cerebral spastic paralysis due to antenatal cerebral defects, and including the cases characterized by spastic paralysis of the entire body or of the lower limbs alone. Birth trauma and asphyxia neonatorum are also found, and premature babies may be affected with no history of trauma. The pyramidal tracts develop very late or fail to develop at all. In very severe cases the baby is so stiff in early infancy that it is difficult to dress him, and he cannot sit up at all. Such cases are due to very early cerebral injury. Less severe forms are recognized only when the child begins to walk. The spasm of the adductors forces the knees tightly together, and when the child tries to walk, whether he is held or not, the legs tend to cross, producing the "scissors gait". Paraplegic children show also ocular disturbances; nystagmus, strabismus and pupillary inequality are



common. The facial muscles may be affected, causing a mask-like appearance. Spasm of the pharyngeal and laryngeal muscles causes dysphagia and dysarthria in a considerable proportion of these children. Involuntary, choreic and athetoid movements are common. Intention tremor and intention spasms are more marked when the child is placed upon his feet.

Mental defects are very common in Little's disease. Rarely the paraplegic child shows fairly normal mentality. The difficult speech and abnormal condition of the muscles of expression often lead to faulty diagnosis of greater mental defect than is actually present.

There is a tendency to improvement in this condition. The development of the pyramidal tracts late in childhood may permit fairly normal control over the muscles, and only a slight stiffness be found remaining of the paraplegia. In very severe cases, recovery always slight, and the mental defect renders this of little value.

**Pseudobulbar paralysis** is characterized by double hemiplegia plus bilateral involvement of certain of the cranial nerves. The muscles of expression, deglutition and speech are affected, though the child is usually able to suck and to swallow. When he is older he may learn to push the food backward into the pharynx with his finger. It is difficult to determine the mental status of the child since the paralysis of the muscles of expression and speech, as well as of the limbs, prevents his expressing himself with any accuracy whatever. Probably mentality, at best, is very much subnormal. Epilepsy and athetosis may be marked, or may be absent or slight.

**General athetosis** (general chorea) is characterized by slight or no paralysis, and bilateral choreic movements which are most marked on attempts at voluntary motion. All voluntary muscles, including those of expression and of speech are affected. The muscles may be extremely flaccid instead of being spastic, but the disease is classed with the spastic paralyses of children because it, also, is due to cerebral hemorrhage.

**Cerebellar forms** include two groups, that due to hemorrhage affecting both the cerebrum and the cerebellum, and that due to delayed development of the long tracts of the cord, including the pyramidal. In the first group there is no definite paralysis, and every muscle can be contracted voluntarily, but no co-ordination is possible. The head falls to one side, and the body collapses when the child attempts to sit, stand or walk. In the second type (spastic tabes) the lower limbs are most affected, and by spasticity without paralysis.

### Treatment

Treatment of postnatal cerebral hemorrhage at the onset consists of rest in bed, and the application of cold, usually ice bags, to the head. Inhibition of the splanchnic centers lowers the blood pressure and thus tends to relieve the hemorrhage.

Hot applications to the feet and abdomen are useful in causing dilatation of the blood vessels of the lower part of the body, and thus diminishing the general blood pressure.

The convulsions are often difficult to manage. The hot baths, mustard baths and various rubs which are so useful in the convulsions of digestive disorder may bring relief in the cerebral cases, but are often useless. Inhibition of the splanchnic centers may give some relief, probably by lowering the blood pressure. Inhalations of ether may be required; rarely it is necessary to administer chloral hydrate per rectum. This is best avoided unless the convulsions are absolutely uncontrollable, and seem very severe. Unless there is some reason for believing that the evil effects of any drug are less than the effects of the convulsions, they must be avoided. No drug sufficiently powerful to stop the muscular movements due to cerebral irritation can be considered harmless.

**Paralyses.** After the paralysis is recognized, its treatment becomes a matter of first importance. Rest is essential at first, though some movement is to be permitted. The child must not stand until improvement has begun, or until two or three weeks have passed, if he has been able to walk before the paralysis, and if he has never walked, he must not be encouraged to learn to do so until his own efforts prove a certain amount of vigor in the limbs.

When some tendency to improvement has been noted, or, in most cases, as soon as the child is brought to the osteopathic physician, the affected muscles must first be examined and the extent of the paralysis definitely noted. Any change noted then becomes a matter of definite record, and the improvement can be easily measured. The spinal lesions, always present as the result of the paralysis, should be corrected gently; they are sure to recur, but the spinal column must be constantly kept as nearly normal in position as is possible. This alone exerts a definitely beneficial effect upon the circulation and innervation of the affected muscles, and improvement is often recognizable after such treatment.

The affected muscles should be given gentle massage each day; the masseur must be instructed as to the ends to be attained by his work, and he must not allow the child to become fatigued.

When the paralysis has been followed by definite contractures which produce deformities, the work of an orthopedic surgeon becomes necessary. Lengthening of the tendon Achilles relieves part of the deformity due to contracture of the superficial posterior crural muscles. Tendon transplantation is indicated under many conditions. Choric movements and athetosis are absent from muscles which have been affected by tendon transplantation.

By Foerster's operation the sensory nerves to the spastic muscles are cut, and thus the spinal reflexes leading to the spastic contrac-

tion are eliminated. The selection of the nerve groups to be sectioned is a matter of considerable difficulty. It is hardly necessary to mention the ill effects which might follow ill-judged selection.

By Stoffel's operation the motor nerves to the affected muscles are partially sectioned, thus preventing the spastic contractions. This has been fairly useful in relieving the contractures of the paralyzed muscles of the arms.

Nerve transplantation, nerve stretching and various other plastic operations upon the nerves, tendons and muscles have had a certain amount of value in selected cases.

The advice of a skillful orthopedic surgeon is always necessary in order to provide the best possible surgical methods.

Epilepsy following cerebral hemorrhage often requires the treatment employed for idiopathic epilepsy. If the epilepsy is Jacksonian and the symptoms are localizing, in selected cases the skull may be trephined and the irritating clot or mass of scar tissue removed. This operation is sometimes successful, but more often the results are not desirable.

### Prognosis

Postnatal cerebral hemorrhage is much less often fatal than is cerebral hemorrhage in adult life, or cerebral hemorrhages occurring before or during birth. Severe trauma, in which the skull is fractured and the brain lacerated are, of course, fatal, but the hemorrhages due to slight trauma, or to severe coughing, as in pertussis, or to meningitis or thrombosis are never fatal unless some pre-existing disorder has already brought the child almost into a moribund condition.

When the paralysis begins to diminish very soon after the onset and improvement is rapid, very nearly complete recovery may be expected. When the initial improvement is delayed and of slow progress, there is apt to be very considerable amount of permanent paralysis. Facial paralysis usually disappears completely within a few weeks, or a few months, at most. A slight limp or hesitation in gait often persists, whether the child walked before the injury or he learns to walk afterward.

The later appearance of epilepsy cannot be predicated in any individual case; serious cases in the beginning are not more apt nor less apt to be followed by epilepsy than are cases mild in the beginning.

Considerable improvement is to be expected under proper treatment and education, in any case. When epilepsy develops the prognosis becomes more gloomy, and it is impossible to predict the onset of epilepsy or of the choreic and athetoid movements. Those in

which the mental defect is absent or is slight have much better prospects than those in which there is imbecility or idiocy. Definitely idiotic children never show much improvement.

### CEREBRAL EMBOLISM

This occurs as a result of endocarditis, in children. It is very rare. The symptoms and treatment are those of cerebral hemorrhage. Absorption and recovery may occur.

### CEREBRAL THROMBOSIS

This not a rare accompaniment of the infectious or the marantic diseases.

**Cachetic thrombosis** occurs in children under five years of age. Pneumonia, diarrhea, pertussis, tuberculosis, marasmus, nephritis, diphtheria and other severe diseases may be associated with thrombosis. The superior longitudinal sinus is most often affected. The blood in the veins which supply it often become coagulated. Occasionally thrombosis is followed by strabismus, headache, convulsions, and coma.

Treatment is of little value, and death usually occurs within a few hours.

**Septic thrombosis** (Inflammatory thrombosis; sinus-phlebitis) is usually associated with meningitis or otitis media. Trauma, necrosis of the cranial bones, or any general or localized infectious process or infection from the throat in scarlet fever or diphtheria may cause this type of thrombosis.

**Diagnosis.** In meningitis the occurrence of thrombosis rarely adds to the symptoms. In other conditions headache, chills, feverish attacks with wide fluctuations of temperature, localized tenderness of the scalp and sometimes convulsions and vomiting suggest cerebral irritation, and thrombosis may be suspected. Metastasis may occur, with the development of abscesses anywhere in the body, but especially in the lungs.

If the superior longitudinal sinus is affected, there is usually cyanosis of the face, epistaxis, and dilatation of the veins of the forehead and temples. If the lateral sinus is affected, the jugular vein may also be affected, and this can be felt as a hard cord in the neck. In this case also the veins of the mastoid region are usually dilated and the mastoid tissues may be edematous. If the cavernous sinus is affected, the eyeball is usually protruded and the retinal veins greatly dilated. Vision is lost in the affected eye, or may be only disturbed; this can be determined if the child is conscious. The eyelids of the affected side are edematous. The cavernous sinus may be affected on one or both sides.



**Treatment.** The lateral sinus may be opened and the clot removed. The superior longitudinal sinus is rather less easily operated.

Osteopathic reports do not include these cases, except when the early stages of the disease has been neglected. It seems that the circulatory efficiency usually maintained by osteopathic treatment prevents the occurrence of thrombosis.

**Prognosis.** Unless the coagulum is removed, septicemia and death usually follow thrombosis of the cerebral sinuses. Death is from cerebral abscess, septicemia, pulmonary abscess, or meningitis. The child may live for several weeks, but usually death occurs within ten days or less.

### SPINAL HEMORRHAGE

Hemorrhage into the spinal cord or its membrane is much less common than cerebral hemorrhage, and it is also much more serious than are cerebral hemorrhages of the same extent.

**Etiology.** Difficult birth, especially breech presentations with forceps, rupture of vessels from pertussis, hemorrhages into the spinal canal in the hemorrhagic diseases, and rupture of the vessels by trauma are all rare causes of spinal hemorrhages. The blood may escape from any one or more situations.

Meningeal hemorrhage (hematorachis) is most common. The blood escapes from the meningeal vessels, and by its pressure causes varying degrees of sudden, severe pain, hyperesthesia, paresthesia, and muscular spasm. Later paralysis of the striated muscles and the sphincters and diminished sensation below the hemorrhagic area appear, and these are usually persistent.

Hemorrhage into the substance of the cord (hematomyelia) causes sudden paralysis but not, usually, any marked sensory disturbance. The area of the hemorrhage determines the area of the paralysis to some extent, though almost any hemorrhagic area is apt to involve the legs somewhat, and to diminish the patellar reflexes.

Diagnosis is usually easy, upon the occurrence of the symptoms.

**Treatment.** The child should lie upon the stomach, and ice bags be placed over the area in which the hemorrhage is occurring. Hot applications to the feet and the abdomen may lower the blood pressure and tend to relieve the bleeding. When the osteopathic physician arrives he should give treatments to lower blood pressure, etc.

**Prognosis.** Death usually occurs in the intraspinal hemorrhage, and often occurs in the meningeal hemorrhage. Recovery may be complete in the meningeal type, but hematomyelia is usually followed by a destructive myelitis and some paralysis is usually persistent, in the few cases in which life is preserved at all.

## CHAPTER LXXIII

### INFLAMMATIONS OF THE BRAIN

The brain is subject to inflammatory conditions due to trauma or to infection. The infectious agent may reach the brain from without, as in abscesses due to neglected otitis media, by way of the blood or by way of the nasal mucous membranes. The lymphatic and venous drainage is found somewhat impeded in all cases examined by osteopathic physicians. The contraction of the anterior muscles caused by lesions of the cervical vertebra raise the upper ribs and the clavicle. The contracted muscles passing through the thoracic inlet diminish its size. There is no extra room in the passage, and when the area of the thoracic inlet is diminished by the contraction of the muscles passing through it, or by any disturbance of the angle which the spinal column makes with the upper ribs and the clavicle, venous and lymphatic congestion of the brain and the cranial structures generally is practically inevitable. Under conditions otherwise normal, this condition may cause nothing more than a dull headache or some slight disturbance of the sensory organs of the head. When there is any other cause of cerebral disturbance, these lesions may greatly exaggerate the effects of such factors.

Lesions of the lower thoracic may cause ischemia of the abdominal organs and thus hyperemia of the brain. This condition predisposes to infection. Lesions of the thoracic vertebra also diminish immunity to infections of all kinds studied, and these lesions predispose to cerebral infection as to infection of other parts of the body.

Several types of encephalitis are present among children. Abnormal circulatory states of the brain may properly be included with the truly inflammatory diseases.

### CEREBRAL ANEMIA

The causes of subnormal blood supply to the brain are many. Hemorrhages lower the blood pressure, and thus cause cerebral anemia. Diarrheal diseases, severe vomiting, fever, polyuria and profuse perspiration all concentrate the blood and diminish its amount, thus causing anemia of all organs. Fright, shock, grief and excitement of any other kind tend to interfere with the action of the heart and usually to dilate the splanchnic blood vessels, and thus anemia of all organs, but especially the brain, is produced. Passive hyperemia or edema of the brain tend to diminish the caliber of the smaller blood vessels of the brain, and this also causes anemia, though the intracranial pressure is not thereby lowered.

**Symptoms** are fairly definite. Paroxysmal attacks are characterized by syncope, pallor, nausea, dizziness, drowsiness, yawning, sweating, rapid pulse and rapid respiration, and the appearance of swimming, bright or dark spots before the eyes, and ringing, roaring or crackling noises in the ears. Convulsive movements of the head and limbs may occur and these may resemble epilepsy. Babies show depression of the fontanelles.

Chronic symptoms include occasional attacks of the symptoms just mentioned, insomnia alternating with drowsiness, delirious states occurring alone or alternating with coma, and various other mental and physical symptoms. These patients become exhausted by comparatively slight physical or mental exertion, and are easily excited.

Marasmic children suffer other symptoms also, diarrhea without other recognizable cause, dilated pupils and abnormal eye movements, feeble pulse, very rapid, hasty breathing, retraction of the head, restlessness and jactitation. Convulsions and coma appear later. In many cases the symptoms resemble those of meningismus or of meningitis, or of hydrocephaloid states.

**Treatment** is primarily that of the cause of the anemia. The child should lie quietly with the head a little lower than the rest of the body. The heat of the body must be maintained carefully. Friction of the extremities may tend to improve the circulation. These things should be taught the mother or nurse.

Lesions of the vertebra of the splanchnic region may cause dilatation of the splanchnic vessels, and these must be carefully corrected. Muscular tension of this region may have the same effect, and such tension must be relieved. The effects produced by these corrections are frequently very satisfactory. If there is marked desiccation the water intake should be speedily increased. If the child cannot or will not swallow enough water, enemas, the two-way colon tube, or the drip method may be employed. In those cases in which sudden relief is necessary hypodermocentesis is indicated. In these cases it is an increased amount of blood that is required, without regard to the quality. The quality of the blood can be improved as soon as the child is able to take and digest food properly.

In paroxysmal attacks, the child should be laid with the head lower than the body. Chafing the hands, arms and feet may give some help. Manipulations increasing the mobility of the interscapular region stimulate the heart, temporarily. Quick movements made in order to determine the flexibility of the lower thoracic vertebra, with quick correction of such lesions as may be found, causes temporary constriction of the hepatic and intestinal blood vessels, and this increases the blood pressure and tends to relieve the cerebral anemia. None of these measures for temporary relief is in any

sense curative, and measures for the relief of the underlying disease must be taken as quickly as is practicable.

**Prognosis.** If the primary cause of the anemia can be removed recovery should be uneventful. If the primary cause cannot be relieved, the treatment outlined gives relief.

### CEREBRAL HYPEREMIA

A mild degree of cerebral hyperemia is caused by lesions which diminish the area of the thoracic inlet, by lesions which affect the vasomotor nerves to the meninges, and, perhaps, to the brain. This type of cerebral hyperemia is a cause of headache, irritability, insomnia, mental dullness and a tendency to nausea and vomiting. The capillaries are dilated as a result of the dilated arterioles, and the veins are somewhat dilated by the increased flow from the capillaries.

Passive cerebral hyperemia may be due to any of the causes which interfere with the venous circulation. Chronic heart disease or any respiratory impediment may also affect the venous return, and thus cause passive cerebral hyperemia. Convulsions, laryngismus stridulus, coughing and straining at stool may also cause venous hyperemia of the brain. Tumors, abscess or any cause of pressure upon the jugular vein or the descending vena cavae may cause passive cerebral hyperemia.

Active hyperemia may be due to acute infectious diseases, insolation, over-eating or renal disease. Active hyperemia rarely causes other symptoms than those of the primary disorder.

**Symptoms** of cerebral hyperemia vary. Vertigo, headache, dizziness, scintillating scotoma, insomnia, restlessness and dilatation of the veins of the neck are the more common causes. In more severe cases, stupor, convulsions and coma may appear and these closely precede death.

**Treatment** includes the correction of any lesions of vertebra or ribs which might interfere with the vasomotor supply to the meninges or, possibly, the brain, or which might diminish the size of the thoracic inlet. The primary disease should receive proper attention. The child should lie with the head somewhat elevated. Cold compresses or an ice bag may give relief.

**Prognosis.** The outlook of the primary disease is affected little or not at all by the occurrence of cerebral hyperemia.

Hyperemia due to vertebral or costal lesions disappears quickly upon the correction of the lesions.

### CEREBRAL EDEMA

Edema of the brain is rarely recognizable during life. It may be caused by cerebral abscess, hemorrhage, embolism or thrombosis



of the cerebral vessels, tumors in the cranial cavity, trauma, serous meningitis, heart disease, renal disease or the agonal state.

Slight degrees of edema do not produce any symptoms other than those of the primary disorder. Severe degrees of cerebral edema cause stupor and death.

The treatment and prognosis are those of the primary disorder.

### EPIDEMIC ENCEPHALITIS

(Acute Infectious Encephalitis; Lethargic Encephalitis; Nona; Poliomyelencephalitis; Epidemic Stupor; Sleeping Sickness)

This is an infective disease, characterized chiefly by lethargy, paralysis of the third and other cranial nerves, neuritis, and many other symptoms referable to disease of the central nervous system.

**Etiology.** Sex is not important. This disease is rather more common in adults than children. It has been found in babies under two months old. The predisposing factors are the lesions mentioned in the introductory paragraph of the chapter. General health, sanitary conditions and poverty do not seem to be important in etiology.

The disease has been reported under various names for about 200 years. Only since 1918 have epidemics been recognized and their effects carefully studied. The disease followed an epidemic of influenza just after the Great War, and there is no doubt that it is transmissible.

The infectious agent is not known. There is some reason for believing it to be identical with that causing acute poliomyelitis. The relation with the influenza epidemic is of interest. Possibly more than one organism is concerned. Encephalitis occurs without previous manifestations of any disease. The method of transmission is not known. During an epidemic many children contract the disease who have not been associated with other children at all, and who have not associated with adults known to be ill. It is rare to find more than one case in a family.

**Tissue changes** include only microscopical lesions in typical cases. Round cell infiltration is extreme, and is found chiefly in the base of the brain and the basal ganglia. The lateral and third ventricles, pons, cerebral aqueduct, cerebellum, optic thalamus and fourth ventricle are usually also infiltrated. The perivascular tissue shows the most marked infiltration. The sheaths of the small veins are also deeply infiltrated. The nuclei of the third, sixth, seventh and twelfth nerves are usually affected, in the order of their frequency. These changes resemble those found in poliomyelitis. On the other hand, the cerebral nerve cells do not show atrophy in this disease, though the same cells may show atrophy in the encephalitis form of poliomyelitis.

**Symptoms** vary greatly in different epidemics and in different children in the same epidemic. The diversity of the locations within the nervous system most seriously affected accounts for the diversity of the symptoms observed.

The onset may be insidious, so that it is not possible to determine just when the disease has its beginning. More commonly the onset is abrupt, with fever, nervousness, delirium and sometimes convulsions. In other cases lethargy, apathy or stupor is the first symptom and the condition persists during the course of the disease.

Fever may not be present, but usually is present during the first few days, at least. It rarely exceeds  $102^{\circ}$  F., but may reach  $104^{\circ}$  F. After the end of the second week fever is rare and usually indicates some complication. The temperature of the body may rise to an excessive height just before death.

The blood shows neutrophilic leukocytosis, usually to about 15,000 per cubic millimeter. The spinal fluid may be normal, or may show 20 to 200 cells per cubic millimeter. Globulin may be increased slightly.

Vomiting is often present at the onset, but is never very severe in typical cases. Diarrhea and constipation are not common.

Respiratory symptoms are not conspicuous. There may be marked hyperpnea during stupor in the early stages. Sighing may occur during the second week or afterward.

Sensory symptoms are not conspicuous. Headache and pains in the eyes and in different parts of the body may be present, but are rarely severe and are never pathognomonic.

Mental symptoms are severe. Excitement and delirium are common in young children. There may be symptoms of mania. These active symptoms are followed by stupor, apathy or prolonged, deep sleep.

In many cases no stage of excitement is present, and the lethargy which gives a name to the disease is present from the beginning. Remissions and even intermissions in the mental state occasionally occur. The child may seem clearly conscious for a few minutes or a few hours. In other cases the mentality remains excitable and fretful, or drowsy. He may remain awake most of the night, singing, spitting, talking, according to some delusion or hallucination, swearing, making grimaces and being generally naughty. The next day he may seem sane and almost well except for some drowsiness.

After the acute stage of the disease has passed, the mental state seems greatly changed. Little children usually pass into a state of imbecility or idiocy. Severe cases in older children may have the same unfortunate termination. In cases which do not seem very severe during the acute stage there may be marked mental involve-

ment afterward. The converse is true, but these relations are rather exceptional. The older the child the greater is the hope of fairly normal mentality.

For a long time after an attack of encephalitis the child's psychology remains peculiar. There is a great tendency for these children to remain irritable, excitable, fussy over trifles, restless, talkative, disobedient and lazy. Ideas of honor seem lost, and the child is apt to lie, steal and allow himself to be dirty and ill-clad. Tantrums and emotional storms are frequent. Fixed ideas and obsessions are common. These conditions should be considered in dealing with children who have suffered from encephalitis.

Motor symptoms are extremely profound in all cases. Tremors, jerking movements, choreiform and athetoid movements are common, and may be associated in the same child or may follow one another in the same child, or one or two types only may be present. Rhythmical contractions of a certain set of facial muscles are common. Almost any strange movement of the face, legs, arms or body may be found during an epidemic. No doubt the location of the brain areas affected accounts for the peculiar symptoms. Motor activity seldom lasts for more than three or four days, but exceptionally may persist for many months.

Paralysis follows the motor excitability, but may occur without the period of increased movements. The muscles which have been active may be paralyzed, but this is not usually the case. The muscles innervated by the cranial nerves are most frequently affected, but almost any muscle or muscle group may, in occasional cases, be affected.

Diplopia, facial paralysis, strabismus and a peculiar mask-like expression, due to the involvement of the facial nerve, are very common. Pharyngeal paralysis may interfere with swallowing. The bladder and rectum are not affected.

The paralysis is of the spastic, upper neuron or cerebral type. Hemiplegia, monoplegia and diplegia are found. The reflexes are exaggerated and the paralyzed muscles do not show the electrical reaction of degeneration. When the peripheral nerves are involved the paralysis may be flaccid and the reflexes may be absent.

The paralysis disappears almost completely during the first few weeks after the acute attack. Some dragging of the foot may persist and there is usually some persistent paralysis of the muscles of the hands and arms. This paralysis is of the spastic type, except for the few rare neuritic paralyses. In patients who remain paralyzed two or three years, or longer, the contractures are found to be serious, and to add to the disability.

Differential diagnosis may be difficult. Poliomyelitis is often confused with this form of encephalitis, with which it is supposed,

by some authors, to be identical. Cerebral hemorrhage may present considerable difficulty in diagnosis. The spinal fluid may give the diagnosis, but may give no useful information. Meningitis may be confusing in atypical cases. The symptoms are, so far, the most useful method of differentiating these various conditions.

**Treatment.** The methods advised for poliomyelitis are useful in this disease. The same methods of isolation should be employed as for any other transmissible disease.

An ice bag over the head gives relief during periods of excitement. A neutral bath is rarely required, but in cases characterized by great delirium and excitement the neutral bath may give quiet.

Absolute rest is necessary. The room should be darkened and quiet. Return to normal activity should be gradual.

Massage is useful during the paralysis. The residual paralysis, if any, is apt to cause grave contractures, and for this reason the limbs should be kept in normal position, as nearly as this can be done. Orthopedic surgery may be employed in old cases, in which the deformity resulting from the contractures is annoying.

**Prognosis.** Lethargic encephalitis is rarely fatal. The paralysis may disappear completely within a few weeks. Facial paralysis, especially, rarely persists for more than a few weeks. Jacksonian epilepsy, due to the scar tissue left by the inflammation, may occur at any time after the encephalitis, even several years afterward.

## PURULENT ENCEPHALITIS

(Cerebral Abscess; Abscess of the Brain)

This is always secondary to purulent processes elsewhere. Possibly skull injury may be followed by abscess, but this is extremely rare. Suppurative conditions of the scalp or of any of the viscera may cause purulent encephalitis. The most common cause, however, is otitis media. Pyemic abscesses may be multiple, but otherwise the abscess is single.

**Symptoms** are vague. No symptoms at all are usually caused unless the meninges are affected. (The brain itself contains no sensory nerves, but the meninges are fairly well supplied with sensory nerve endings.) In any child with otitis media, any rather rapid decline, with mental symptoms, dullness or irritability, increased temperature and increased neutrophilic leukocytosis indicates probable brain abscess. In some cases the temperature remains unchanged or may diminish somewhat.

Sensory aphasia, headache, vertigo, dim vision, vomiting, foul breath, slow pulse and mental apathy suggest involvement of the cerebrum. Convulsions may be followed by coma. Hemataxia, nystagmus, ataxia, diminished tone of the muscles one side compared



to the other, and a tendency to turn to one side or to walk around in an irregular circle indicate cerebellar involvement.

Rupture into the ventricles is followed by collapse and death.

**Treatment** is surgical. The abscess should be opened and drained if it can be localized. If the abscess cannot be localized or cannot be drained, the treatment for acute encephalitis should be given.

**Prognosis.** If the abscess can be drained the prognosis is good for complete recovery. If the abscess cannot be localized or if it cannot be drained the outlook is gloomy. In a few cases the abscess has not been localized nor drained, and yet the child recovered, apparently completely. These cases may not have been really purulent encephalitis.

## CHAPTER LXXIV

### MYELITIS

#### (Inflammations of the Spinal Cord)

Invasion of the spinal cord by any of the pyogenic bacteria may set up a severe inflammation of the gray matter. The white matter is less subject to the effects of bacteria, partly, no doubt on account of the presence of myelin.

Lesions of the lower thoracic vertebrae lower immunity in general, and these may be considered as predisposing agents.

Poor nutrition, bad air and faulty hygiene are also predisposing causes, but these are somewhat less in importance in diseases of the nervous system than they are in other diseases, since children who are healthy, well cared for and living in excellent sanitary conditions suffer from these diseases almost as frequently as do the children of the tenements.

Myelitis due to injuries of the spinal column is not very common among children. Compression myelitis, due to Pott's disease, and acute epidemic poliomyelitis are much more common during childhood than during adult life. Myelitis involving both the gray and the white matter may be due to any of the infectious diseases or to injury. Acute poliomyelitis may be due to any one of several infectious agents, but is usually due to a specific virus. The various forms of myelitis require separate discussion.

### ACUTE POLIOMYELITIS

(Acute Infantile Paralysis; Meningo-encephalo-myelitis; Epidemic Polio-myelitis)

This is an acute infectious disease which is characterized by its usually mild course and the destruction of certain areas of the spinal cord with resulting lower neuron paralysis.

**Etiology.** Lesions of the lower thoracic vertebrae are predisposing causes since the immunity to all, or nearly all, of the infections is lowered by such lesions.

Age is an important predisposing cause. A large proportion of cases occur in children under ten years old, while the years between one and five are most dangerous so far as this disease is concerned. It has been known to occur at the age of six weeks, and above the age of thirty years.

Sporadic cases are frequently found before and after an epidemic. Epidemics were not described before 1905.

Nearly all epidemics occur in the summertime, in the northern hemisphere in July, August and September; in the southern hemi-

sphere in February, March and April. Nearly all countries show some cases, and usually some epidemics. The children of the wealthy, the well-to-do and the poverty-stricken are about equally affected.

Other infectious diseases, poor nutrition, lowered vitality, overwork, exposure to cold or to heat, nervousness and the other conditions which predispose to so many infectious diseases seem to be of little or no importance in infantile paralysis.

Individual susceptibility is not marked. Only about 2% of all children exposed to the disease acquire it, and many cases occur in which no exposure can be determined.

Very rarely cases which appear to be typical infantile paralysis follow typhoid fever or some other acute infectious disease. Unless the spinal fluid has been examined or the child dies and a post-mortem examination made it is usually impossible to determine definitely whether the paralysis is due to the bacteria of the primary disease, or whether the usual infectious agent of epidemic poliomyelitis has gained entrance at this time. These infectious agents nearly always cause transverse or diffuse myelitis when they affect the cord itself.

The infectious agent of epidemic poliomyelitis is an extremely minute organism, capable of passing through a porcelain filter. It can be transmitted to monkeys, but is not known to affect other animals. The virus is found in the inoculated monkeys in the brain and spinal cord, the salivary glands and the lymph nodes, the tonsils, nasal and buccal mucous membranes, the intestines and, very early in the disease, in the blood and the cerebrospinal fluid. It may persist in the nasal mucous membrane for seven months or more.

The method of transmission is not known definitely. There is some reason for supposing that the virus reaches the nasal mucous membrane, and thence is carried to the spinal cord and the brain by the lymph channels. Or, it may be carried to the intestines from the nasal membranes or from infected food, and thence be carried to the spinal cord. The blood is rarely found to contain the virus, though it may be responsible for transmitting the virus to the nerve centers. Carriers have been found, in whom cultures from the nasal secretions contain the virus, and cases have, apparently, been due to the visit of a person from an epidemic area to an area which had, until that time, been free from spinal paralysis. In a few cases there seems to be house-transmission. Dust, bed-bugs, the stable fly and other insects have been found capable of carrying the virus, and the stable fly has been most vigorously accused of spreading the disease.

The incubation period has not been definitely determined, but is probably from five to ten days. In monkeys the incubation period varies from three days to three weeks.

**Tissue changes** are characteristic. No doubt they are less widespread and less severe in the cases which are not fatal. In fatal cases post mortem examinations show the effects of extremely virulent infection.

In the nervous system the meninges of the cord and the medulla are first affected. The membranes are infiltrated with small round cells. The blood vessels are markedly affected, their walls are infiltrated with small round cells and are swollen to such an extent the lumen is diminished considerably. The meningeal tissue nearest the vessels is most seriously inflamed. Anemia, edema and small hemorrhages are the result of the inflammation and of the impeded circulation. Thrombosis is rare. No doubt the transient paralysis is caused by these conditions. The permanent paralysis is due to the actual destruction of the nerve cells.

The cells of the anterior horns of the cord, especially in the cervical and the lumbar enlargements, are especially affected by the inflammatory processes. (The impeded circulation alone exerts a deleterious influence, especially if the child makes an attempt to use the muscles innervated by these segments). The inflammatory exudate and probably the toxic products of the bacteria, the edema and the impeded circulation are speedily followed by degenerative changes in the nerve cells of the affected gray matter. In some segments of the cord only a few cells become degenerated, in others it seems impossible to find any normal nerve cells at all in the anterior horns.

The white matter is affected to some extent, but the axons are rarely destroyed. The spinal ganglia and the nerve roots may also share in the inflammatory changes, though they rarely show any degenerated cells or tracts.

Other parts of the nervous system are involved occasionally, and the spinal cord may or may not be seriously affected. The cerebrum and cerebellum show changes of the same character, and the effects then produced greatly resemble those caused by epidemic encephalitis.

Degenerative changes are found also in the heart muscle, liver, spleen, kidneys and lungs, as in any acute infectious disease. All of the lymphoid tissue, especially the tonsils and the intestinal lymphatics, show hyperplasia and inflammatory changes. The tonsils often become purulent, other organs rarely.

In late cases, there are long, slender areas of degeneration in the anterior columns, most marked in the anterior and lumbar enlargements. In these areas the cells have been destroyed by the inflammation, and the areas are filled more or less completely by neuroglia. The location and severity of the paralysis depends upon the location and the extent of the degenerative changes.

The affected muscles show atrophy, after the paralysis has been present for a few months or longer. After some years have passed, in very severe cases, the muscles which are paralyzed may be represented as small masses of connective tissue with only an occasional muscle cell to be found.

The joints which are affected by the paralyzed muscles do not show marked changes at autopsy.

### Diagnosis

The onset resembles that of other acute infectious diseases. Fever rarely exceeds 103° F. and may be much less. In some cases no fever or other symptoms of the stage of invasion can be found, and the paralysis is the first symptom. Headache and prostration vary, but are not usually more marked than in other acute infections. A scarletiform rash occasionally appears on the first day. Convulsions occur in about half the cases, but are not unusually severe. Vomiting is often a first, and usually an early symptom. It rarely persists beyond the first day. Diarrhea may be associated with the vomiting, in which case gastrointestinal disorder is suspected. Constipation which antedates the fever is more common than diarrhea. Respiratory symptoms, such as coryza, bronchitis and pharyngitis,



are fairly common. Conjunctivitis is often associated with coryza.

Tension and hypersensitiveness of the cervical and thoracic muscles are always found.

Nervous symptoms vary. Persistent drowsiness is usually present in some degree. Hyperesthesia is usually found; it may be general, rarely is localized. Somnolence and coma are occasionally present. Tenderness and pain on movement are almost always present, and may be severe. Sharp, darting pains in the limbs are common; they do not seem to bear any relation to limbs which are paralyzed later.

The symptoms persist for from two or three days to ten days. The fever is sometimes continuous, sometimes remittent. It may fall by crisis or by lysis. The pulse remains high during the stage of invasion, higher than the degree of the fever would indicate. Renal disorders are not common, but there may be retention or incontinence.

The blood, at first, shows either no changes or a leukopenia, with a slight increase in the small lymphocytes. Later a moderate leukocytosis is found.

The spinal fluid shows increased cell count, of which 80% or more are neutrophils. The count varies from 15 to 200 or more cells per cubic millimeter.

The spinal fluid is clear or opalescent, coagulates in certain cases, reduces Fehling's solution and gives moderate reaction for globulin. Within about two weeks after the onset the spinal fluid is usually normal.

It must be remembered that in many cases the period of invasion is marked by mild or no recognizable symptoms, and that the paralysis may appear very suddenly during the night, or even while the child is walking or playing.

With the subsidence of the fever and other symptoms of the stage of invasion, the acute stage of the paralysis appears. Marked muscular weakness may be thought to be the result of the fever. This stage may be postponed for three days or a week after the child seems to be fairly well again, but usually occurs within a short time after the symptoms of the acute disorder have disappeared. This weakness is followed by the paralysis, which is, at first, widespread and may include all four of the limbs. It is usually, even at this time, limited to the limbs which are later found to be permanently paralyzed. The deep spinal muscles, innervated from the same segments as the paralyzed, are hypersensitive and edematous.

The location of the paralyzed muscles varies greatly. The most common locations are, in order of frequency, one leg, both legs, both legs and both arms, one leg and one arm, on same side, one arm only. The less common locations are, in order of frequency, both arms alone, the face, abdomen and muscles of respiration. Very rarely

the muscles of the neck and those concerned in deglutition are paralyzed in this disease.

The widespread paralysis persists for two to six weeks. During this time some atrophy of the paralyzed muscles appears, and this may be very rapid. Much aching and pain may be present during this time.

Some feverish attacks may appear, but these do not persist and are rarely associated with other symptoms.

After a variable time, one to six months after the onset, the paralysis begins to diminish in extent. The muscles which do not then regain their tone show more rapid atrophy. The paralyzed limb is smaller than normal, and is peculiarly soft and flabby. The tendon reflexes associated with the paralyzed muscles are absent or very greatly diminished.

Patients who do not have osteopathic treatments make the greatest amount of improvement during the first half-year, but some improvement is noted for two or three years. The amount of improvement each month becomes gradually less and less, until no change can be found on the most careful examination from one month or one year to another.

When the paralysis becomes stationary, if all or nearly all of the muscles of a limb are paralyzed, the bone and other tissues lag behind the rest of the body in growth. The affected limb is both small and shorter than normal. The wasting of the muscles permits articular deformities. The circulation of the affected limb is impeded, the skin is colder than normal and bluish. The affected muscles become contracted and shortened and this causes deformities such as talipes and claw-hand. Various abnormal positions of the hands and feet are caused in different cases by the contracture of different muscles. Scoliosis may be due to the paralysis of one leg or of one arm.

Electrical reactions are characteristic. After the period of invasion, the affected muscles fail to react to either galvanic or faradic current. Very soon there is an exaggeration of the galvanic response. The anodal closing contraction becomes greater than the cathodal closing contraction, which is the reaction of degeneration. The galvanic response becomes gradually less and the reaction of degeneration persists, with gradually decreasing response, until, about three years after the onset of the disease no muscular contraction can be secured by any form of stimulation possible during life.

### **Atypical Forms**

Several types are described, which vary somewhat from the typical spinal paralysis.

**Abortive type.** This is frequently reported in osteopathic practice, and has been described for cases under medical care. The onset

is that of the usual type, and may be, apparently, very abrupt and severe. The various types of symptoms, respiratory, gastrointestinal and so on, are as in the typical case. The stage of invasion may be severe, or may be mild. Muscular weakness, pain and rigidity in the back and neck and other symptoms of the typical disease are present. No paralysis follows, though there may be weakness of certain muscle groups or single muscles for a few weeks afterward.

The fact that any case is really an aborted infantile paralysis can be shown by the facts that the spinal fluid has the characteristics of acute poliomyelitis; that the nasal secretions can be used to cause poliomyelitis in monkeys and that the blood changes are typical of that disease.

**Rudimentary type.** This is a form of the abortive in which there is slight, temporary paralysis.

**Larval type.** In this type there is no evidence of paralysis at all, and the diagnosis is very difficult. The disease would not, probably, be suspected except during an epidemic.

**Meningitis type.** The inflammation attacks the meninges with great severity. The symptoms include severe headache, vomiting, sometimes of the cerebral type, pain and rigidity of the back and neck and sometimes opisthotonos, delirium, convulsions and coma.

**Progressive type.** This type is rather rare. It resembles Landry's paralysis. The paralysis affects the legs first, most commonly, and then the arms, trunk, diaphragm and the muscles of deglutition and respiration. Death occurs within ten days or so after the onset. Probably many cases supposed to be Landry's paralysis are really this type of infantile paralysis.

**Polyneuritic type.** This is the type noted in a recent epidemic. It is characterized by great pain and stiffness of the muscles, but usually without other sensory disturbance. Paralysis may be widespread after the inflammatory stage is over, or may be completely absent.

**Bulbar type** (Encephalitis inferior) or Pontine type (Encephalitis superior). In this form the bulbar or pontine nuclei are involved. The spinal centers are affected simultaneously, earlier, later or not at all. Any of the cranial nerves may be affected, but the facial, abducens and hypoglossal are rather more often affected. Respiration, deglutition and the heart's action may be affected, and death become inevitable.

**Ataxic type.** In this very rare type ataxia is the most marked permanent injury. Some paralysis may be associated with ataxia. The nucleus pontis, other co-ordinating nuclei of the pons, and the nuclei of the cerebellar peduncles are probably the locations of the degeneration. Bulbar centers are usually associated with this type.

**Encephalitic form.** Epidemic encephalitis now seems to be due to the same virus as that of infantile paralysis. This disease is discussed elsewhere.

In many cases of infantile paralysis there are associated cerebral symptoms. The onset is that of the ordinary spinal type, but the headache and convulsions are more constant and more severe. The pupils usually react sluggishly to light. Fever is rather higher than in the spinal type. The ensuing paralysis is of the upper neuron type and usually hemiplegia. The face usually recovers completely, the leg becomes improved while the arm remains permanently paralyzed and ultimately becomes greatly deformed from the contractures. Reflexes are exaggerated, the paralysis is spastic and the ultimate condition is that of the paralysis of cerebral hemorrhage.

### Differential Diagnosis

Meningitis is often simulated by those cases of poliomyelitis in which there is high fever, rigidity and marked hyperesthesia. The spinal fluid gives quite different findings in the two diseases and the blood findings also are different.

Multiple neuritis is gradual in its onset, and usually follows diphtheria. The blood and spinal fluid are different in the two diseases.

The pseudo-paralysis of rickets or scurvy may simulate infantile paralysis, but a little care in making a physical examination should easily differentiate the two diseases.

Birth palsy is differentiated by the history. If this cannot be secured the differentiation, in the permanent state, may be impossible. The same thing is true of cerebral paralysis due to hemorrhage and cerebral paralysis due to acute poliomyelitis.

### Treatment

The communicable character of the disease must be recognized. Isolation of the patient is imperative. The quarantine should be maintained for at least a month. During epidemics this time should be doubled. If the child is isolated from other members of the family, there need be no house quarantine. All discharges, especially those from the mouth and nose, should be quickly destroyed by burning. The nurse should not associate in any way with other children, and not with adults if this can be arranged. Any person who enters the sick-room should carefully wash the mouth and the nasal and pharyngeal passages with sterile water or any mild solution before he associates with other people, and especially before he associates with children.

In an epidemic the closing of the schools may be considered. This is rarely indicated. Children should not be permitted to assemble in poorly ventilated rooms, and it is usually desirable to refuse



them theaters. Until more definite information can be secured as to the method of transmission of the disease, it is best to consider it carried by every manner followed by infections, and to guard against any possibility of transmission.

As in any sudden febrile disease occurring in children, the mother should put the child to bed at once, having given him a warm bath and an enema. He should be kept as quiet as possible and the room should be somewhat darkened. No food should be given, if the child is old enough to eat, until the osteopathic physician arrives. Fruit juices may be permitted if the child is hungry, and he may have all the cool water he wishes. This is routine for any sudden disease in children.

The treatment employed for acute infectious diseases in general is indicated. The muscular tension should be relieved. If definite lesions are found on examination, the manner of relaxation may tend to the correction of the lesions, but generally no definitely corrective measures are to be employed during the acute stage of the disease. If the fever is high a few minutes steady pressure over the tense tissues (always present in fever) near the sixth to the eleventh thoracic vertebral spinous processes lowers the temperature. If the headache is severe, a similar pressure over the suboccipital triangles often gives relief.

During the first few days, the various bactericidal functions of the body are of first importance. These must be kept in the most active condition possible, by removing every condition which might interfere with their normal functions. The lymphatic and venous drainage from the spinal canal and the skull must be kept free. The circulation through the liver, lungs, kidneys and spleen must be kept normal.

Abundant water supply and low food supply helps to prevent toxemia. The bowels must be kept clean, preferably by enemas. The bed-pan must be used, even if the child does not seem very ill.

It must be remembered that at first there is no actual destruction of the nerve cells, but that the inflammatory processes in the central nervous system and especially in the anterior horns of the cord interfere with the arterial supply, the venous drainage and the elimination of the waste products of bacterial action, with the edema and the increased heat of the body, injure the nerve cells. If any stimulation of the nerve centers occurs these nerve cells suffer still greater injury. The effort the child makes to stand or walk a few steps may make the difference between life-long paralysis of the legs and slight or no paralysis. This enforced quiet during the first week or two of the disease is of vital importance.

No methods of examination which are made with any exertion of the patient, no testing of reflexes, no tests of the muscular state and

no voluntary motion is to be permitted during the acute stage of the disease. The child should lie upon the side, and he may be turned, very gently, from one side to the other and to different positions on the same side. Very often the child is most comfortable lying upon the stomach, with the head or chest supported upon a firm pillow. The necessary treatments are easily given while he is so placed. The child must never be permitted to lie upon the back for more than a few minutes at a time, and that only when it may seem necessary.

Food is not given, except to nursing babies, and then the milk should be diluted by giving the baby one or two spoonfuls of sterile water just before nursing. Children who are able to eat should be given water and fruit juices in abundance, but no solid food until the acute stage has passed. Even when the fever is gone a diet composed chiefly of fruit juices and vegetable juices with a small amount of milk provides the best possible diet for recovery. It is for only a few days, and malnutrition does not follow so short a time of restricted diet.

The bowels should be kept open, usually by small, mild enemas, always given over the bed-pan.

After the acute stage is over, if no paralysis is evident, the child should still be kept in bed for several days. His first voluntary efforts should be gentle, and if the least pain follows the effort he should remain quiet another day. If the paralysis does appear, rest is still necessary.

The pain in the limbs and back can be somewhat relieved by protecting the limbs from the weight of the coverings. This is secured by using a cage over the limbs and under the covers.

When the muscles of deglutition are affected, feeding is difficult. Soft mushy foods are usually more easily swallowed than either solid or liquid foods. The head and shoulders may be lowered during the feeding, and thus choking is usually eliminated. It may be necessary to feed by means of a stomach tube.

After the fever and other symptoms of the acute stage have been absent for a week, the paralyzed muscles must receive treatment. The spinal muscles, soft tissues and the spinal column should be kept normal. The affected limbs must be kept warm and be rubbed, sometimes with light friction once or several times each day, according to the condition as found on examination. In keeping the limb warm, burning must be carefully avoided. The skin of these limbs is easily injured by heat or by trauma. Passive movements and massage are excellent and should be given gently and regularly. No efforts toward the use of the affected muscles should be made until a certain amount of tone is recognizable to the touch, on palpation. Then the child may be permitted to try to use the muscles, very delicately at first, but with increasing effort. It must be kept in mind that the pathological changes of the nerve centers in the

cord disappear rather slowly, and that the least amount of over-activity of the affected nerve centers may initiate further destructive changes. Yet, if the affected nerve centers are too long left inactive, destructive effects may be produced.

The use of electrical stimulation is the subject of controversy. Schaller, of Stanford, advises electrical stimulation of the affected muscles immediately after the subsidence of the acute symptoms. Faradic and sinusoidal currents are painless. Galvanic currents cause pain when the current is interrupted, but exercise a somewhat more beneficial effect. Probably the effects produced by osteopathic treatment are more beneficial, less harmful and generally more efficacious in maintaining normal circulation and normal control of both nerve centers and muscles than any other method of treatment. When it is not possible for the child to receive the treatment as often as he should, the use of some form of electrical stimulation is useful. It at least protects the muscle from disuse atrophy.

Mechanical supports are often required for the limbs in late stages. Orthopedic surgery is of great value in these cases.

When the child is first brought for treatment some years after the acute attack, the condition often seems hopeless. Yet, in many osteopathic case reports, there are accounts of great improvement in the paralysis as the result of treatments, sometimes many years after the acute attack. The correction of lesions, the securing of good circulation through the cord and the peripheral tissues and the manipulations required for correcting, in part, the contracted tissues often increases the comfort and the usefulness of the child or the young person very greatly.

The voluntary efforts of the child are useful during the secondary, late and old cases. The definite efforts at control cause stimulation of the nervous mechanism from the cortex to the centers which have been destroyed. Whether this stimulates injured cells to increased and more normal activity or whether other centers assume a new duty is not yet determined, and is only of academic interest. The influence of this effort is good, but it must be definitely explained, very clearly, that the effort is toward cure, and that he must not expect immediate results from the procedure. He may make only a few efforts each day at first. Later, if he tires of the effort, it may be made into a game for him.

By employing peripheral stimulation and central stimulation at the same time, if there is any possibility of using the injured cells or developing new pathways through normal nerve tissue, it will surely be accomplished.

### Secondary Myelitis

**Acute myelitis** may result from injury to the spinal column, or may follow typhoid fever, scarlet fever, diphtheria and other acute

infectious diseases. It is often attributed to exposure to cold, but in these cases some infectious agent is probably concerned also.

**Chronic myelitis** is rare and is due to syphilis.

In these acute infectious diseases inflammation of the spinal cord may be facilitated by incorrect structural conditions or by the bad nursing which permits the child to lie for too long a time upon the back.

The onset depends upon the character of the infectious agent and the reaction to the infection made by the body. There may be a gradual onset, with local symptoms only, or a very stormy onset with fever, severe pain and any one of various convulsive seizures.

**Transverse myelitis** is characterized by sensory and motor paralysis and exaggeration of the reflexes below the lesion. At the level of the lesion there are hyperesthesia, girdle pains and flaccid paralysis of any muscles which happen to receive innervation only from the affected segments. Reflexes are absent. Trophic and vasomotor disorders are always serious.

Loss of control of the sphincters, bed-sores, electrical reaction of degeneration of the paralyzed muscles and their later atrophy are caused by transverse myelitis. When the lesion is in the cervical region all of the symptoms are present, but are more widespread. The pupils are contracted in nearly all cases. Atrophy of the muscles of the arms indicates a considerable area of the cord involved in the myelitis.

**Diffuse myelitis** is characterized by the irregular distribution of the paralyzed areas.

Prevention of myelitis is not always possible. Trauma may be avoided, and immediate surgery may occasionally prevent myelitis after certain types of spinal injury. During any disease, the child should not be permitted to lie for too long a time upon the back.

**Treatment** includes gentle correction of such abnormal structural conditions as may be found anywhere in the body, the application of ice bags to the spine and counter-irritation. Mustard and capsicum may be employed, carefully avoiding injury to the skin. Electricity is always to be avoided; very rarely in old cases some improvement may follow electrical stimulation. The effects of the corrective measures are much more desirable.

When there is reason to suppose any considerable area of the cord destroyed, the only treatment is to keep the child very clean and to avoid bed-sores. Catheterization is necessary and cystitis follows unless the most scrupulous asepsis is employed.

**Prognosis** is absolutely dark for recovery or for definite improvement. Slight improvement in the condition may occasionally be found, probably due to compensation, but death is to be expected within a few years, usually due to pneumonia, tuberculosis, cystitis and nephritis or any other intercurrent disease.



## COMPRESSION MYELITIS

Spinal caries is by far the most common cause of compression myelitis. Trauma causes a few diseases. Myelitis due to the compression of the cord by tumors within the spinal canal or as the result of chronic pachymeningitis are very rare.

In tuberculosis of the spine (Pott's disease; spinal caries) the disintegrated bodies of the vertebra permit an angular deformity. The remnants of these vertebral bodies, an accumulation of inflammatory products, debris and occasionally tubercular deposits crowds the canal, already diminished by the angular curvature, until the pressure upon the cord causes its inflammation and final destruction. Occasionally the body of a vertebra gives way rather suddenly, and the myelitis is of sudden onset. Usually the onset is very gradual. The spinal cord endures what seems, on examination, to be a remarkable amount of compression without any apparent change in its functions.

Ascending and descending degeneration of the white tracts in the cord follow this, as other, forms of destruction of any segment of the cord.

**Symptoms.** In the cervical region the spinal canal is small and there may be symptoms of myelitis before any deformity of the spinal column is recognized. In caries of the thoracic spine the deformity is almost always found before the symptoms of myelitis, and in the lumbar region the canal is so large and the cord so small that myelitis is not common even though the deformity may be considerable.

The first symptoms are usually sensory, and are referred to the areas innervated by the affected nerve roots. Weakness of the legs and arms, and then paralysis of the muscles of the limbs, according to the location of the spinal injury. Anesthesia, paresthesia, pain, vaso-motor symptoms and other changes dependent upon the location of the spinal injury follow. In the upper cervical column, sudden death may result from the disintegration of the odontoid. Vomiting, hiccough and pupillary disturbances result from pressure upon the upper part of the cervical cord. Paralysis of the legs and arms result from injury to the pyramidal and other descending tracts. When the lower thoracic or the lumbar segments are involved, bedsores, bladder and rectal disturbances are associated with flaccid paralysis of the leg muscles and the loss of reflexes of the legs. The arms then escape paralysis altogether.

**Treatment.** Spinal caries can be avoided by the proper care of tubercular children. If the deformity is recognized at an early date, as is almost invariably true in osteopathic practice, proper treatment prevents further deformity and thus prevents compression myelitis from that cause.

When the child is first seen with symptoms of myelitis, the relief of the pressure by some suitable support is the only rational treatment. Orthopedic surgery offers several operations and several methods of support, which vary according to the needs of the individuals affected. The best attainable orthopedic surgeon should be consulted, since very severe results may follow incorrect orthopedic treatment, while most satisfactory results follow wise treatment.

The treatment for tuberculosis is always indicated.

**Prognosis.** In early cases the paralysis disappears rapidly, when the pressure has been removed. In late cases, some symptoms may be relieved but complete recovery is hardly to be expected. In some cases the inflammation of the cord persists after the pressure has been removed, and the paralysis may be first noted after the pressure has been removed. In these cases the prognosis is very gloomy. It is unfortunate that in these cases it is generally supposed that the operation has not been properly performed, or the supporting apparatus improperly fitted.

Compression myelitis due to tumors is rare. The treatment is the removal of the tumors. The prognosis is not good for complete recovery even then. If the tumors are not removed transverse myelitis is probably inevitable.

### Purulent Myelitis

#### (Abscess of the Spinal Cord)

This is a rare condition during childhood. Multiple small accumulations of pus are often present during poliomyelitis, cerebrospinal meningitis and in other conditions in which the cord or its meninges are affected.

Definite abscess formation is due to trauma followed by pyogenic infection in most cases, but may be due to purulent infections elsewhere in the body. Definite abscesses may be associated with meningitis or other inflammatory diseases of the brain or cord.

Diagnosis is almost impossible during life. The symptoms somewhat resemble those of transverse myelitis, with high, irregular fever. Treatment is unavailing and death is inevitable.

## CHAPTER LXXV

### DISEASES OF THE MENINGES

The meningeal blood vessels are supplied with vasomotor nerves. The cerebral meninges have their vasomotor control by way of the carotid plexus and the lateral horns of the cord of the first to the fifth thoracic segments. The spinal meninges have their vasomotor control from the ganglia of the sympathetic chain by way of the gray rami of the ganglia of the corresponding segments.

Lesions of the cervical vertebrae cause edema of the tissues surrounding the disturbed articular surfaces, thus affecting the sympathetic ganglia of that region. Such lesions also cause contractions and contractures of the anterior cervical muscles, and these diminish the thoracic inlet by their swelling. Such contractions also raise the upper ribs and the clavicle slightly, and this also diminishes the thoracic inlet. The blood and lymph of the cranium pass to the thorax and the heart by way of the thoracic inlet, which is not too large for the structures passing through it. Anything which diminishes the thoracic inlet interferes to some extent with the fluids passing through its vessels. The thinner walls of the veins and the lymph vessels permits them to be affected more seriously by a given amount of pressure than are the arteries with their thicker walls. The cerebral veins have no valves, and thus any impediment to the venous drainage tends to affect the cerebral drainage somewhat seriously.

The lesions of the cervical vertebrae act also by the pressure and subnormal alkalinity due to the edema of the tissues around the lesioned areas, and this affects the cervical sympathetics, which lie just in front of the vertebral column. The vasomotor impulses to the meningeal arterioles are thus disturbed, and congestion of a mild but constant type is the result. It is evident that lesions of the cervical vertebrae are important predisposing factors in any type of meningeal inflammation.

Inflammatory states of the meninges, however produced, result in various disturbances of the sensory and the motor centers. These, in turn, increase muscular tone or cause distinct muscular contractions, and these produce varying effects according to the segments affected. In the case of the cervical muscles, the thoracic inlet is diminished in area. In spinal areas the lesions already present are perpetuated by the abnormal muscular tension. The edematous condition associated with abnormal muscular tension exerts evil effects also, on account of the increased pressure and the diminished alkalinity of the tissue fluids.

The meninges are subject to the ill effects due to toxemia, as are other tissues of the body. The cerebrospinal fluid seems resist-

ant to the entrance of many of the toxic substances sometimes found in the blood stream, but the capillaries of the meninges and the brain carry toxins as easily to these tissues as do the capillaries of other parts of the body.

### EPIDURAL HEMORRHAGE

This rather rare injury is due to trauma. During difficult labor the head may be so compressed as to cause this hemorrhage, or injury to the cranium after birth may produce the same type of hemorrhage. The blood flows into the space between the dura mater and the skull, producing an internal cephalhematoma, and this is, in birth injuries, usually associated with an external cephalhematoma. The symptoms are those of increased cerebral pressure. If the condition is recognized and the blood removed, there is a possibility of recovery. The children so injured usually die even if the clot is removed, and they always die if the clot is not removed. Death is to be expected within a day.

### EXTERNAL PACHYMENINGITIS

This also is rare during childhood. It usually is purulent, and results from middle ear infection which reaches the meninges by way of the mastoid cells. Rarely the frontal sinus or the nasal sinuses may be the primary site of the infection, which then reaches the meninges by direct extension. The inflammation may extend to the inner surface of the dura (internal purulent pachymeningitis).

The symptoms include headache, cerebral vomiting, optic neuritis, bradycardia, somnolence, coma, and irregular pulse and respiration, in severe cases, or the symptoms may be very slight or negligible.

**Treatment.** Prophylaxis is most important. Every case of middle ear disease or infection of the cranial sinuses should be treated with regard to the possibility of meningeal infection. Any accumulation of pus should be drained before there is danger of meningeal invasion.

When the disease develops, it is necessary to distinguish between pachymeningitis and leptomeningitis. Operative exploration is usually the only method of differentiation. The purulent focus in pachymeningitis can usually be well drained, and recovery should be uneventful, if the infection has not been too widely spread over the meninges.

### INTERNAL PACHYMENINGITIS

(Internal Hemorrhagic Pachymeningitis; Subdural Hemorrhage)

In early childhood pachymeningitis may occur in any severe infectious disease, in rickets, syphilis, cachexia however caused, severe pulmonary or cardiac disease, or in the hemorrhagic diseases. Birth trauma is rarely a cause of this type of hemorrhage.



The condition is rare and is not easily recognized. Probably the inflammatory changes cause the hemorrhage in all but traumatic cases.

**The symptoms** may not be distinguishable from those of the primary disease, and when recognizable are due to the hemorrhage rather than to the inflammation. Headache, vomiting, convulsions, loss of consciousness are early symptoms. Later the fontanelles bulge, the pulse becomes slow and irregular, respiration becomes slow, and fever may be absent, mild or severe. If the child lives, paralysis, rigidity and other symptoms of cerebral injury may appear. Diagnosis can probably never be definitely decided until autopsy.

Internal pachymeningitis may be suspected when the symptoms as mentioned occur during the course of any severe disease, especially those characterized by cachexia or hemorrhages elsewhere in the body. The fluid obtained by lumbar puncture is usually slightly blood-stained, and may be distinctly bloody.

**Treatment** is that of cerebral hemorrhage in general. Ice may be applied to the head, and manipulations which lower the blood pressure may be useful.

**Prognosis.** Death may occur within a few days. In other cases the condition becomes chronic, with alternating remissions and exacerbations. Older children may recover, with or without persistent paralysis, according to the location and extent of the brain injury.

## MENINGISMUS

(Pseudomeningitis)

During the course of almost any of the toxic or infectious diseases in childhood symptoms may be produced which greatly resemble those of leptomeningitis. Lumbar puncture produces normal cerebrospinal fluid. Autopsy shows no recognizable meningeal changes.

The symptoms are probably due to toxic substances. Possibly there may really be present a mild serous meningitis.

**Treatment** should be the correction of any conditions which might interfere with the drainage from the cranium or the spinal canal. Such lesions include those affecting any considerable area of the spinal column, especially of the cervical and upper thoracic region; abnormal contraction of the cervical muscles, especially the scaleni and the sterno-mastoids; abnormal position of the clavicle and the first ribs. Abnormal functions of the liver, kidneys and heart may also affect the circulation and the drainage of the meninges.

**Prognosis.** The occurrence of meningeal symptoms does not usually affect the course of the primary disease.

**SEROUS MENINGITIS**

(Sero-fibrinous Meningitis; Acute Acquired Hydrocephalus; Serous Apoplexy; Toxic Meningitis)

The meninges may become inflamed from the toxic products of bacterial action, without themselves being directly infected. It is not a rare complication of otitis media and other purulent processes. Any of the acute infectious diseases, especially pneumonia and typhoid fever, may cause this type of meningitis. Syphilis also is a causative factor in some cases.

**Diagnosis.** Acute cases have a sharp onset, with high fever, sometimes to 106° F. or more; severe convulsions; contracted pupils; muscular rigidity; coma and occasionally speedy death. Less severe cases are characterized by headache, moderate fever, convulsions, vomiting, delirium, rigidity of the muscles of the neck, and occasionally coma. Occlusion of the cerebral aqueduct leads to accumulation of the fluid in the ventricles, and thus the development of internal hydrocephalus. The anterior fontanelle bulges greatly, in babies; the pulse becomes slow and irregular; choked disc, slow respiration, convulsions and coma follow. Occasionally the onset is slow, and resembles that of tubercular meningitis.

The fluid obtained by lumbar puncture is under high pressure, but gives normal findings on examination. In cases with hydrocephalus the spinal fluid may not be under high pressure, and may be more scanty than under normal conditions.

The blood changes are those of the primary disease. The urine usually shows albumen, but not usually any actual evidence of nephritis.

With the most thorough examination, it may not be possible to determine accurately whether an atypical case is serous meningitis, or tubercular, purulent or pneumococcic meningitis, or cerebral abscess or meningismus.

**Treatment.** When the symptoms are fairly definite, lumbar puncture may permit the escape of a few cubic centimeters of cerebrospinal fluid and thus relieve the intracranial pressure. This may be repeated once in two days or three days, according to the rapidity with which the fluid is formed and the symptoms of intracranial pressure develop.

Careful examination should be made for anything which might interfere with the drainage from the cranium. Lesions of the upper ribs and the clavicles, abnormal tension of the tissues of the neck, lesions of the cervical and upper thoracic spinal column are the most common of these factors which impede the circulation and the drainage of the cranium.

Elimination must be maintained at normal level. Fresh water must be given freely. Lesions affecting the circulation through the

liver and spleen are often present, and these must receive careful treatment.

The child should be kept very quiet. The clothing must be very loose and light, so that changing may not cause any annoyance. If the temperature exceeds 103° F. the body should be sponged with water at about 97° F. The relief of the muscular contractions, always present in the lower thoracic region, diminishes the fever. This is usually best accomplished by means of steady pressure upon the affected muscles, using palmar surfaces of the finger tips. As soon as there is perceived a lessening of the muscular tension, the pressure should be gently removed.

**Prognosis.** The children with violent, acute onset of serous meningitis usually die within a few days. When the onset is less violent, they may live for several days or weeks and then die. Others develop chronic acquired hydrocephalus and live almost indefinitely so far as the meningitis is concerned, and they are subject to optic atrophy, paralysis of the lower cranial nerves, or spastic paralysis of one or more limbs, according to the location of the cerebral pressure conditions following the inflammation of the meninges. In a few cases recovery seems complete and no ill effects are noted afterward. More commonly recovery seems complete, but after some years have passed, epilepsy, mental defects or a recurrence of the meningitis occurs.

### EPIDEMIC CEREBROSPINAL MENINGITIS

(Cerebrospinal Fever; Meningococcus Meningitis; Spotted Fever)

This is an acute infectious disease characterized by acute inflammation of the cerebral and spinal meninges, and the symptoms referable to this inflammation.

**Etiology.** Predisposing causes include lesions of the cervical vertebrae and lesions of the lower thoracic vertebrae. Other lesions are usually present, and lesions of the clavicle and the upper ribs are fairly common. Children examined by osteopathic physicians and in osteopathic clinics have been found to have such lesions; later these children have contracted meningitis during an epidemic while other children, known to have no such lesions, equally exposed to infection, have failed to develop the meningitis. Animals in experimental laboratories, not lesioned, either do not contract the disease or do not suffer severely; lesioned animals, equally exposed, almost always contract the infection and die quickly.

Age is important. Children above ten years old, and adults, rarely contract epidemic meningitis.

Individual susceptibility seems important, even apart from the question of bony lesions. Rarely more than one child in a family contracts the disease during an epidemic, though isolation and quar-

antine are usually neglected. Since the epidemic of 1905, there is a tendency to isolation and, in some cities, to quarantine. It is difficult to determine whether an attack confers any immunity or not.

Epidemic variations are marked. Epidemics have been noted in New York City at intervals of about ten years. In some epidemics the disease remains localized; in others it tends to spread over nearly all the country. In some epidemics the contagiousness is marked; in others it is impossible to determine exactly that there is any contagiousness at all.

The *diplococcus intracellularis meningitidis* is invariably present, and is the infectious organism. It is found within the pus cells and the polymorphonuclear neutrophils in the cerebrospinal fluid, and may often be found free in the fluid. This diplococcus has the biscuit-shaped arrangement and the grouping relations of gonococcus, and, like this, is Gram-negative. It is usually found in the buccal and nasal secretions early in the disease, rarely late in the disease, and it is sometimes found in the blood. Animals who have been given intraspinal injections of living diplococcus contract meningitis, and they also show the diplococcus in the nasal secretions.

The mode of infection is not yet known. There is some reason for suspecting that it reaches the nasal mucous membrane, and then the cerebral meninges by way of the cribriform plate. The digestive tract has also been considered a port of entry. It is probably true that every case of meningococcus meningitis is associated with bacteremia. The period of incubation has not yet been determined.

Sporadic cases are frequently recognized. The specific bacterium is found in the cerebrospinal fluid, but no other child contracts the disease, though many children may be exposed, unless there is present or impending an epidemic. Epidemics begin with sporadic cases, but in any sharp epidemic several sporadic cases usually occur at about the same time.

Tissue changes are about the same in all types of meningitis. In fulminating cases, the meninges may show little or no change, or there may be merely a very marked congestion. If the child lives a few days, a semipurulent exudate is found; this usually occupies the folds of the pia-arachnoid. The dura is often cloudy. When the child lives a week or more before death, an abundant fibrino-purulent material is found in the meninges over the cortex; it may be arranged in roundish plaques, or may be most abundant along the fissures and around the blood vessels; the choroid plexus is involved and the ventricles are full of purulent or semipurulent liquid, and usually distended by this; the roots of the cranial nerves may be bathed in a similar fluid; the posterior areas of the spinal cord and the nerve roots may be surrounded by the fibrino-purulent fluid and there may be quite distinct masses of coagulum. The brain is deeply congested and softer than normal; there may be



marked or slight round-celled infiltration, and the meningococcus is usually present. The dura mater and the bones of the skull are also deeply congested, infiltrated, edematous, and occasionally show the infectious agent.

Other organs of the body are also seriously affected. Probably otitis media is a constant complication. Suppurative inflammations of the pericardium, the heart muscle, endocardium, throat, lungs, kidneys, liver, joints and orbital tissue are commonly found. Echy-moses of the skin, serous membranes and joint surfaces are also common.

**Diagnosis.** The symptoms are often diagnostic of meningitis, but when there is no epidemic it is not possible to determine the type of meningitis without examination of the cerebrospinal fluid, obtained by lumbar puncture.

There may be prodromal symptoms, especially in epidemic meningitis, or the onset may be sudden in any acute meningitis. The prodromal symptoms include headache, malaise, dizziness, feverishness and chilliness, anorexia, nausea and pain in the back and the limbs.

With or without the prodromal symptoms, which are always vague, the onset is sudden. Fever, often to 104° F., severe headache and pain in back and limbs, prostration, delirium, vomiting, sometimes diarrhea, sometimes convulsions and a speedily developing stiffness of the neck, retraction of the head, opisthotonos, and other symptoms of cerebral disease make the diagnosis almost definite. Cutaneous, visual and auditory hyperesthesia become marked within a few hours or a day. These sensory disturbances may be so marked that any sudden noise, or a gentle touch, or, more commonly, a ray of light may initiate convulsive movements or evidence of marked suffering. Occasionally the child seems almost deaf, while the visual hyperacuity is marked. Cries of pain may be common, or the child may be stuporous.

The limbs are often stiff, orthotonos may be more marked than opisthotonos. Convulsions may continue at intervals during the attack, or the convulsion of the onset may not be repeated. At any attempt at voluntary or passive movements severe pain is produced. The head, back, and legs ache and sharp pains are frequent. The pains in the head, neck and back are increased by the rigidity of the muscles.

The face is drawn with pain, and the mouth often has the position of risus sardonius. Herpes facialis is almost always present. Strabismus, pupillary irregularities, congestion of the face and of the eyeballs and grinding of the teeth are usually very marked.

Cutaneous symptoms are variable. Eechymoses, petechia, purpuric spots and eruptions resembling herpes zoster may appear. The

hemorrhagic areas gave the old name "spotted fever" to this disease.

**Digestive symptoms.** Vomiting usually initiates the attack, and this may persist until great prostration results. It is commonly of the projectile type, but may be merely very violent. The tongue is coated and appetite is lost, as in any fever. Constipation often precedes the attack, and usually persists unless thorough treatment is given.

**Temperature varies.** There is no apparent relation between the height of the fever and the severity of the disease. Usually there is rather a high temperature at the onset, perhaps to 105° F., but a temperature of 101 F. to 103° F. is more common. Sudden changes in temperature frequently occur, and these may be rather sudden. Very high temperature sometimes precedes death. During convalescence or when the meningitis becomes chronic irregular temperature changes are commonly found.

**Blood pressure** is usually low, but may vary from hour to hour.

**Pulse.** Considerable irregularity may be noted in the pulse rate. There seems to be no definite relation between the temperature and the pulse.

**Respiration** is not usually affected by the meningitis itself. The pain may affect breathing, as any pain may. In other cases, not necessarily more serious, Cheyne-Stokes breathing, sighing or irregular respiration may be noted.

**Mental symptoms vary.** Restlessness and sleeplessness are usually present during the early stages of the disease. Delirium is common, and maniacal symptoms, often violent, are not rare. The violence and persistence of delirium seem to bear no relation to the severity of the attack. Delirium may alternate with coma, or with normal mental states. Coma and apathy are most marked in very severe cases, and coma may precede death.

**Blood examination** shows an invariable leukocytosis, sometimes to 40,000 or more. Of these polymorphonuclear neutrophils are very high, sometimes to 90% of the leukocyte count. The eosinophiles are very much diminished, and may be altogether absent.

**Urinalysis** shows the usual changes characteristic of fevers in general. Sugar is often present in small amounts.

### Variations

**Abortive forms occur.** The disease begins as in the usual form, but the symptoms disappear within two or three days. Unless the cerebrospinal fluid has been examined, it is not possible to differentiate this form, unless an epidemic is present, from meningismus or serous meningitis. This form is especially common in osteopathic practice.

Mild forms are present. The symptoms are mild from the onset. Slight headache, slight nausea and vomiting, stiffness of the neck with some pain, and some irritability may be the only symptoms recognized. During the last weeks of an epidemic these cases are fairly common. The diagnosis is not possible unless the cerebrospinal fluid is examined and the characteristic bacteria found.

Average cases persist for two to four weeks before convalescence is established. Diminution of the symptoms is gradual and exacerbations are common during recovery.

Severe cases resemble the average type, except that all symptoms are severe, and coma is especially marked.

Fulminating or malignant meningitis has an extremely sudden and severe onset with later collapse and speedy death, often within one day. Convulsions may be severe, or coma may appear speedily. Vomiting may be severe and almost constant until death. Cutaneous hemorrhages are usually widespread, and hemorrhage of the mucous surfaces are common.

Chronic meningitis may result from the persistence of the acute form. When recovery begins, as in the average case, it ceases, and the symptoms, rather milder than during the acute stage, persist almost indefinitely. Remissions and exacerbations alternate. When the remissions are long and exacerbations severe, the form called "Intermittent" is present. This is really a variation of the ordinary chronic meningitis.

Differential diagnosis rests, in the last analysis, upon the examination of the cerebrospinal fluid.

The diseases whose symptoms resemble those of cerebrospinal meningitis are typhoid fever, pneumonia, grippe and autointoxication. Lumbar puncture and the examination of the cerebrospinal fluid may be the sole means of differentiating these diseases. If meningitis is present lumbar puncture exerts a beneficial influence upon the symptoms, by diminishing the intracranial pressure. If meningitis is not present, the lumbar puncture may cause headache, but not usually any other symptoms. It must be remembered that absolute asepsis and considerable skill is required for this operation, and, except in emergencies, a surgeon skilled in this work should be selected.

### Treatment

Prophylaxis. Isolation of children with cerebrospinal meningitis should be compelled. While we do not know how the disease is transmitted, it is certain that it is transmitted in some way from the sick child to those who are susceptible to the infection. Hence the necessity for maintaining careful isolation, and for complete disinfection of all excretions and secretions of the sick child.

The care of well children also is a useful prophylactic measure. Vertebral lesions are known to diminish immunity, and children who are occasionally examined and whose bony framework is kept in as nearly perfect condition as possible are much less subject to this, as to other infections. Wholesome food, wholesome habits and correct hygienic conditions are also of prophylactic value.

Treatments should be given twice or three times each day. Careful relaxation of all rigid muscles which may be found along the entire spinal column is indicated at each treatment. The cervical and upper thoracic region of the spinal tissues require especial care. Even in chronic cases this treatment must be given. The thickening of the tissues due to chronic meningitis yields slowly but steadily to persistent treatment. The anterior cervical muscles are often contracted and the tissues somewhat edematous. These affect the drainage from the head region, and should be kept relaxed and as nearly normal as is possible. The circulation through the liver and spleen must be kept normal.

Lumbar puncture relieves the intracranial pressure and often gives marked relief. In severe cases this must be repeated several times, at intervals of one to four days, according to the symptoms. Patients who have correct osteopathic treatment from the onset of the disease do not often require lumbar puncture, but it is occasionally necessary.

The patient should be kept as quiet as possible, and it is best to keep the light rather dim in the sick room. No noise or commotion should be permitted. The clothing and bed linen should be changed only when necessary, and with as little disturbance as possible. Quiet is of great importance. The child should not be allowed to lie upon the back, but should alternate sides. Often he is more comfortable when he lies upon the stomach, with the face turned to one side. This position should be changed at intervals. An ice cap and a spinal ice bag are to be applied when the fever is high. When the temperature exceeds 102° F. the body should be sponged with water at about 100° F.

The usual medical treatment is the intraspinal injection of serum. That of Flexner-Jobling is most commonly advised. Lumbar puncture is made, and a few cubic centimeters of cerebrospinal fluid removed. If the pressure is high 10 to 30 cubic centimeters or even more may be removed. The serum should be brought to a temperature of about 100° F., and one to five cubic centimeters less than the amount of cerebrospinal fluid removed should be injected into the spinal canal. The hips should be elevated in order that the serum may be carried along the spinal canal. For babies about 10 cubic centimeters of serum should be injected; for older children 25 cubic centimeters may be injected. The amount injected, under any circumstances, must be less than the amount of spinal fluid



removed. The injection must be made slowly; ten or fifteen minutes is not too long for the serum to flow into the spinal canal. The injection should be repeated daily until the symptoms are ameliorated or until four have been given; after that they may be given at intervals of two to four days, according to the progress of the disease. If no improvement occurs within ten days there is no use in continuing the injections.

In favorable cases, the temperature drops almost to normal within a few hours, mental symptoms abate. The pain and rigidity are diminished, and the child begins to recover within a few days. Examination of the cerebrospinal fluid the next day may show marked diminution of the meningococci and the neutrophiles.

It may happen that no cerebrospinal fluid can be secured, or that no bacteria can be found in fluid which appears normal. In such cases there is no indication for administering serum. It is then advised that the ventricles be punctured and the serum injected into them.

In unfavorable cases the administration of the serum is followed by prostration. Respiratory symptoms may be severe, and artificial respiration may be required. The child may die at this time. In other cases restlessness, muscular rigidity and fever are increased after the administration of the serum. In any case, there may be urticaria, asthmatic symptoms, diarrhea, and other symptoms of serum sickness. These symptoms may appear after the first, second or third injection.

In no case of meningitis is the serum therapy of any value after the acute stage has passed.

### Sequelae

Sequelae less often follow meningitis when osteopathic treatment has been given, and such sequelae as may be found are usually less serious in osteopathic practice. Some injury usually follows acute meningitis, in any case.

Optic neuritis may result in atrophy and blindness. Extension of the inflammatory processes along the pia-arachnoid may result in purulent iridochoroiditis. Neuritis of the fifth nerve may cause keratitis or conjunctivitis, usually purulent. Complete blindness or merely dimness of vision may result.

Otitis media is usually present. Auditory neuritis may cause persistent deafness. Inflammation of labyrinth is not unusual and causes Meniere's symptoms.

Mentality is often affected. Any form of mental defect may result from cerebral meningitis, according to the location and severity of the cerebral injury.

Hydrocephalus is not a rare sequel. Probably the chronic and intermittent cases are often of this nature. It may appear early in

the course of the disease, or may appear some months after apparent recovery. Vomiting, headache, muscular rigidity, convulsions, and finally coma and death are characteristic of this condition.

Paralysis is more common in the eyes and face than in the limbs. When the limbs are involved there may be either hemiplegia or paraplegia.

Pneumonia may result from epidemic meningitis, or pneumonic meningitis may result from pneumonia invasion of the meninges. Since naso-pharyngitis usually precedes both diseases, and since the meningitic symptoms may precede pulmonary symptoms in pneumonia, it is impossible to distinguish between the two forms except by examination of the cerebrospinal fluid.

Nephritis is not a common, but it is a very serious complication. This may lead to a fatal termination, after the recovery from meningitis may seem to be complete.

Arthritis may be due to infection of the joint surfaces with the diplococcus meningitidis. The fluid is greatly increased and may be purulent. In other cases the joint becomes acutely inflamed without any evidence of effusion.

### Prognosis

At the beginning of an epidemic the prognosis is very gloomy. Later cases are milder and the prognosis is fairly good in all cases occurring toward the later weeks of an epidemic. In some epidemics the fatality is great; in others comparatively slight. The mortality may be 75% in some epidemics, 20% in others.

Chronic cases usually terminate in death, though life may be preserved for months.

The younger the child, the more gloomy the prognosis. The fulminant cases are almost always fatal. The more marked the coma, the more gloomy the prognosis. The more sudden and violent the onset, the more gloomy the prognosis.

The older the child, the more gradual the onset, the less marked the coma, the lighter the symptoms generally, and the greater the tendency to increase in the hyaline cells in the blood, the brighter the prognosis.

### ACUTE MENINGITIS FROM OTHER CAUSES

Several types of acute meningitis are recognized, which differ slightly from one another, and which are due to one or more of several different infectious agents.

Meningitis simplex (acute purulent meningitis) is so called on account of the fact that the etiological bacteria were not, at one time, recognized. Pneumococci and influenza are the most common of the bacteria of this type of meningitis.

Pneumococcic meningitis is the most common of the acute meningitides, except the epidemic form. Most commonly this type of meningitis is secondary to pneumonia elsewhere in the body, especially in the lungs. The symptoms are those of epidemic meningitis (q.v.) except that they occur during the course of an attack of pneumonia, or they appear during a time when a pneumonia is prevalent. The onset is sudden, with headache, delirium, convulsions, vomiting and high fever. Stupor may be noted. Rigidity of the neck, opisthotonos, retraction of the head and hyperesthesia are usually less marked than in the epidemic form of meningitis. Occasionally, when the pneumonia itself is severe, there may be no recognizable symptoms of meningitis and the condition is recognized, if at all, at autopsy.

As in other types of meningitis, the diagnosis rests upon the examination of the cerebrospinal fluid. The pneumococcus is nearly always found associated with streptococcus or staphylococcus or both. The cerebrospinal fluid is cloudy and contains many polymorphonuclear leukocytes. The bacteria may be found both in the serum and within the leukocytes.

The treatment is that of epidemic meningitis, except that no serum therapy is considered useful.

Pneumococcus meningitis is usually fatal, but with early, rational treatment a few cases may be saved.

Septic meningitis may occur during pyemia from any cause. Umbilical infection may cause septic meningitis in the newly born. Localized septic meningitis may follow otitis media. Localized or generalized meningitis may follow brain abscess. The cerebrospinal fluid contains many polymorphonuclear neutrophils, and the pyogenic bacteria. An important factor in treatment is the evacuation of pus from the primary focus.

This type of meningitis is almost always fatal.

Influenzal meningitis is due to infection with the bacillus of Pfeiffer, or by the infectious agent of epidemic influenza. It usually occurs during the course of an attack of influenza elsewhere in the body. The symptoms are those of acute meningitis from any cause. The cerebrospinal fluid contains many polymorphonuclear cells and bacilli of influenza both within and without the leukocytes. The bacilli are not abundant, but can be found by careful examination. The prognosis is rather less gloomy in this type of acute meningitis than in the other just mentioned.

Typhoid meningitis occasionally occurs during an attack of typhoid fever. The nervous symptoms are marked during any severe case of typhoid, and meningitis may not be suspected until the autopsy shows evidences of acute meningitis. The cerebrospinal fluid is cloudy with cells, and of these a considerable number are hyaline.

Colon bacillus, gonococcus, streptothrix, bacillus proteus and bacillus pyocyaneus are rather rarely found alone or associated with staphylococcus or streptococcus in meningitis. None of these types of cerebrospinal meningitis can be differentiated from other forms except by finding the pathogenic bacteria in the cerebrospinal fluid.

Tubercular meningitis and syphilitic meningitis are discussed with Tubercular Diseases and Syphilitic Diseases.

## CHRONIC MENINGITIS

(Chronic Basilar Meningitis; Posterior Basic Meningitis)

The persistence of any form of acute meningitis beyond the acute results in a definitely chronic meningitis. Chronic basilar meningitis or posterior basal meningitis is chronic from the beginning.

**Etiology.** The disease is rare in children two years old or more, and is most common in babies less than a year old. The predisposing causes are those of any infectious process. The etiological agent is a diplococcus, probably identical with the diplococcus meningitidis. It differs from this, however, in certain biological reactions.

**Tissue changes** include thickening of the pia and the presence of adhesions between the meninges and the brain. The changes are found chiefly around the base of the brain, the pons, medulla and upper part of the spinal cord. Fluid accumulates around the roots of the cranial nerves, and these may undergo atrophy. The ventricles are distended with fluid.

**Symptoms** resemble those of acute meningitis, except that they are slow in development, are milder in character and persist for days and weeks at a time. A rather mild attack of acute meningitis may initiate the chronic disease. Muscular rigidity, marked wasting, exaggerated reflexes, visual disturbances which are not associated with choked disc, nystagmus, vomiting, irregular fevers alternating with normal or subnormal temperature, apathy, occasional convulsions and occasional delirium are the most common symptoms. All these symptoms are less severe than in the acute form of meningitis. Opisthotonos is usually very much more marked than in the acute disease. The fontanelles bulge; the arms are flexed at the elbows; coma precedes death but is not usually common at an earlier time.

Lumbar puncture produces a somewhat turbid fluid with many neutrophils in the early stages; later the cerebrospinal fluid may appear normal.

**Treatment** is that of acute meningitis, except that the treatments are given three or four times each week, and they must be given for months or years. As the symptoms change from time to time, the treatment also may vary. The relaxation of rigid muscles, the removal of every factor which interferes with the innervation of every



organ or the circulation of the blood through the nervous system and the organs of elimination, and such methods as may be required for building up nutrition and immunity are indicated. These children present grave problems, and no two of them require exactly the same methods of treatment. Treatment must be persistent and improvement is always very slow.

Those who advise the use of serum in the acute stage agree that it is of no avail in the chronic form of meningitis.

**Prognosis.** The child may live a year or more, losing weight constantly, and then die in convulsions or without any recognizable cause for death at that time. Intercurrent diseases have always a fatal ending in these cases. Recovery with hydrocephalus often occurs. Complete recovery is more common in osteopathic than in medical practice, according to the percentages given in medical and in osteopathic reports.

## CHAPTER LXXVI

### PROGRESSIVE DEGENERATIONS OF THE CENTRAL NERVOUS SYSTEM

These diseases are usually familial. Direct heredity is, in nearly all of the progressive degenerations, impossible.

No disorders of this type are found in other organs of the body. In all of these cases treatment may delay the progress of the degeneration, but in no case is recovery to be expected.

#### AMAUROTIC FAMILY IDIOCY

This is a comparatively rare disease, characterized by the gradual development of blindness and mental deterioration, usually with spastic paralysis.

**Etiology.** This disease is most common among Jews, but is not limited to that race. There may be a familial tendency, and several children in one family may die from it. Direct heredity is impossible.

**Pathology.** The brain and cord appear normal, macroscopically. Increased density and elasticity is occasionally evident. Microscopic examination shows degeneration of the brain cells. The nerve cells are swollen, the nucleus becomes eccentric and the differential staining of the nucleus and protoplasm becomes difficult or impossible. The nerve cells finally disappear and their place is filled by neuroglia. There is no apparent reason why these changes should occur.

**Symptoms.** The child seems normal until almost or quite a year old, and occasionally they may seem to the parents to be normal until they are sent to school.

In typical cases the development of mind and body ceases, almost or quite completely. The cessation may be very gradual, or it may be fairly rapid. Dimness of vision is followed by total blindness. The muscles become progressively weaker and finally the child cannot sit alone. Apathy increases until he seems scarcely to be alive.

Paralysis is at first flaccid, but later becomes spastic. The reflexes are diminished or absent at first, but later become increased. Emaciation usually appears later, and the child may die, apparently from inanition. Convulsions may be present, or may not appear.

Typical changes are seen in the retina. The area of the macula lutea is occupied by a whitish or blush area, in the center of which appears a small spot of cherry red. The optic nerve is atrophied.

The diagnosis depends upon the retinal findings, especially the bright red spot.

**Treatment** is of no avail. The prognosis is hopeless for recovery. The child usually dies within a year of the first appearance of the disease. In less fortunate cases the child may live for several years, blind, absolutely idiotic and helpless.

### HEREDITARY SPASTIC PARALYSIS

This is a rare disease, characterized by spastic paraplegia, and occasionally with spastic paralysis of other limbs. It is a familial rather than a hereditary disease. The symptoms appear during the second year, rarely later, and occasionally before the end of the first year of life.

In the spinal type there is a degeneration of the pyramidal tracts and the lateral columns. Spastic paraplegia with increased reflexes and marked contractures, are present.

In the cerebral type the onset is during the first year. Increasing mental deterioration, nystagmus, blindness and gradual physical decline lead to death. Convulsions are not present. The retinal findings differ from those of amaurotic family idiocy.

The child may live three years or more, and finally dies from inanition or some intercurrent disease. No treatment is useful.

### HEREDITARY ATAXIA

(Friederich's Ataxia)

This is a rare disease, characterized by ataxia and inco-ordination of the legs and arms, and other symptoms referable to the degenerative processes in the cord.

It is a familial disease, developing when the child is about to undergo the puberty changes. Ataxia is usually the first symptom. Inco-ordination of the hands and arms, and usually of the muscles of speech, nystagmus, progressive weakness of the muscles of the limbs and body, loss of the tendon reflexes, are early symptoms. Later contractures cause talipes, claw-hand, scoliosis and other deformities. With the later stages, sometimes with the earlier, mental deterioration becomes marked, and these processes go on to complete idiocy with complete paralysis.

A cerebellar form of the same disease does not appear until early adult life.

The differential diagnosis from tabes, multiple sclerosis and certain other very rare diseases of the cord may be difficult.

Treatment is of no value, except for the relief of any symptoms of discomfort. Death may be postponed for several years, and is usually due to some intercurrent disease.

### SYRINGOMYELIA

This rare disease is due to progressive gliosis around the central canal of the cord. Hemorrhages and degeneration of the neuroglial

tissues form cavities in the cord. The nervous elements are degenerated and absorbed. The cause of the disease is unknown.

Since the gray matter is first affected, the first symptoms are diminished sensations of heat, cold and pain in the areas below the lesion in the cord. The sense of touch, being carried by longer tracts toward the periphery of the cord, remains for a long time unchanged.

Weakness of the muscles and wasting of the tissues of one or both arms is usually an early symptom, and the legs later share in the same conditions.

Marked scoliosis is invariably present. This should be corrected if possible.

The outlook is gloomy. Recovery is, in the nature of the condition, impossible. Death may be postponed for some years, and is usually due to intercurrent disease.

### DISSEMINATED SCLEROSIS

(Diffuse; Multiple, Insular or Degenerative Sclerosis)

This is a chronic disease of the central nervous system characterized by the progressive development of sclerotic areas in the brain and spinal cord, affecting the gray and white matter, and producing symptoms referable to the areas affected by this process.

**Etiology.** The disease seems to be due to some poison acting upon the nerve cells and nerve cylinders. It follows poisoning by lead or any other of the metallic poisons, ergot and other poisons; almost any of the acute infectious diseases may be followed by this type of sclerosis. Fatigue, cold and exposure are probably not causative in children. The neurotic constitution is almost invariably present before the onset of the sclerosis. It is possible that symptoms which are considered merely nervous in these cases are really symptoms of the very early stages of widely scattered sclerosis. Females are affected more often than males. The typical form of the disease is more common after puberty, but is occasionally found in children. Hereditary influences are usually found.

Developmental types seem due to hereditary or congenital dyscrasia. The developmental types include the hereditary ataxias and probably syringomelia. The insular type in children is probably of the developmental type also.

**Tissue changes** include many areas of sclerosis scattered among the nerve cells and the nerve tracts. The medullary substance is found degenerated but the nerve fibers remain intact for a long time. The fibers are surrounded by proliferating neuroglia. The nerve cells show degenerative changes, and they often appear to have been injured by the proliferating neuroglia. Whether the cells and fibers, injured by some toxic element initiate the glial over-



growth, or whether the glial overgrowth injures the nerve cells and fibers, is not yet determined. Round celled infiltration is not marked. Secondary degeneration is not marked.

**Symptoms** vary. The onset is slow, with nervous or hysterical symptoms. Emotional instability is marked.

Intention tremor is an early symptom. With no apparent paralysis or weakness of the arm muscles, the patient is unable to perform any co-ordinated movement. The hand shakes and quivers upon any volitional movement. He may become unable to feed himself; he spills water and food and is unable to dress himself. The trembling of the head and of the legs may be extremely severe. He can be still only by lying quietly in bed.

Scanning speech is common. The words are pronounced very deliberately, and each syllable emphasized. Staccato pronunciation is common. Nystagmus is very common. Optic atrophy may lead to complete blindness; usually there is only partial loss of vision. Vertigo is common. Common sensation is rarely affected.

Convulsive seizures may imitate epilepsy, but are usually more irregular in type and last somewhat longer than in true epilepsy. Attacks resembling apoplexy are occasionally noted. Hysterical attacks and varying hysterical symptoms are very common. Mental deterioration is usually present at some stage of the disease, and this is progressive by irregular stages.

The abdominal reflexes are usually absent and the Babinski sign present. Other reflexes vary from time to time, being increased, normal, diminished or absent according to the location and extent of the sclerotic areas in the cord, pons and midbrain.

The disease is usually confused with hysteria in the early stages of the disease. The differentiation may be extremely difficult.

**Treatment.** All conditions which might interfere with the circulation through the central nervous system, or with the lymphatic drainage, must be corrected. The diet should be low in proteids and carbohydrates, and the last should be eliminated. The vegetables and fruits, excepting bananas, should make up the diet almost completely.

Rest is essential. The child should be kept in bed, and no physical or mental exertion permitted, until the sclerosis is found to be progressing in spite of the most careful treatment. The child may then be allowed to spend his days happily, although as much rest as possible should still be secured. Generally he is happier in bed as long as he lives.

The parents must be taught that he cannot control the muscles and that the process is probably incurable.

**Prognosis.** Recovery may possibly occur. The sclerotic areas do not regain their normal state, but compensation can be secured, to some extent, by the activity of other nerve centers and tracts.

Nearly always death follows a few years of progressively increased disability. Some intercurrent disease may terminate the life of the child.

### SPINAL MUSCULAR ATROPHY

Several types of muscular atrophy are due to disease of the spinal cord. The muscular atrophy is thus secondary. Primary muscular atrophies and dystrophies are discussed with other diseases of the muscles.

**Amyotrophic Lateral Sclerosis** (Charcot's type of muscular atrophy) is a disease very rarely found in children. A distinct familial tendency is noted. The cause is unknown. The disease depends upon a progressive degeneration of the anterior horns of the cord.

The first symptoms are weakness and spasticity of the muscles, usually of the arms. This is followed by atrophy and paralysis. The disease affects the spinal gray matter progressively, and the muscular atrophy finally causes complete disability. The bulbar centers are finally affected and death results. No cases in children have been reported in osteopathic practice. No treatment is known to modify the course of the disease. Death is seldom postponed more than two or three years after the onset of the disease.

**Progressive Muscular Atrophy** (Duchenne-Aran type) is very rare in childhood. It depends also upon a progressive degeneration of the anterior horns of the cord, but differs from amyotrophic lateral sclerosis in the simultaneous or secondary involvement of the nerve roots.

Muscular atrophy begins, almost always, in the thenar eminence. The hypethenar and interosseous muscles are next attacked, then the muscles of arms and other parts of the body. The claw-like appearance of the hand (*main en griffe*) is characteristic. Other muscles of the body are, rarely, affected before the hands. Fibrillary twitchings often precede the atrophy, but no spasticity is observed at any time. Atrophy is more marked than paralysis. In late cases the reaction of degeneration is given by the affected muscles. The tendon reflexes are absent or greatly diminished. The muscles of respiration, deglutition and mastication are almost never affected; death is to be expected soon when any of the muscles innervated by the cranial nerves are affected.

The atrophy goes on very slowly, perhaps for ten years or more after its first appearance. Death usually occurs from some intercurrent disease before the atrophy has reached its greatest extent.

No cases have been reported of this disease in children in osteopathic practice. In adults suffering from the same disease, correction of the bony, ligamentous and muscular lesions of the area in close central connection with the atrophic muscles has caused the progress of the disease to cease. No return of function on the part of muscles completely atrophied is possible.

**Infantile Type, Progressive Muscular Atrophy** (Werdnig-Hoffman type) is very rare and seems to be distinctly a familial disease. No other cause is known. It is associated with cord lesions like those of the Duchenne-Aran type, but has quite a different order of progression.

The symptoms begin during the first or second year of life. The atrophy begins in the trunk and thighs, then the neck, shoulders, arms, hands and toes are affected. Tendon reflexes are abolished; the paralysis is flaccid; fibrillary twitchings are occasional but not common; the sphincters and the muscles innervated by the cranial nerves are not involved. Reaction of degeneration may be present; in other cases, the affected muscles show no reaction to electric currents of any kind. The progress of the disease is rapid, and death rarely is postponed beyond the sixth year of life. Death may be from some intercurrent disease. The involvement of the respiratory muscles may cause pulmonary disease.

The diagnosis is not difficult when the family history can be secured. Treatment has not yet modified the course of the disease.

**Progressive Neural Muscular Atrophy** (Peroneal type; type of Charcot-Marie-Tooth) is a rare familial or hereditary disease. It appears most commonly in early childhood and is more common in males than in females.

Degenerative processes are found in the nerve trunks, nerve roots, anterior and posterior column of the cord, and the anterior horns. The disease first appears in weakness and wasting of the peroneal muscles and the extensors of the toes. Foot-drop, high-stepping gait, and, later, clubfoot result from the atrophy. The atrophy spreads to the muscles below the knee. Other muscles are rarely involved. Fibrillary twitchings are common. Pain, hyperesthesia and anesthesia occasionally occur.

The child remains able to walk, though with some difficulty. The progress of the disease is very gradual. Intermissions are long and frequent in some cases, but absent in others. Length of life is not greatly affected by the condition, though it causes annoyance and disability.

Usually much later, but occasionally simultaneously or earlier, the muscles of hand undergo the same changes, causing a typical "claw-hand".

Treatment may cause the process to terminate at any time. The muscles once atrophied cannot return to normal.

## CHAPTER LXXVII

### DISEASES OF THE PERIPHERAL NERVES

The nerves of children are subject to the effects of pressure and other trauma, toxemia, diphtheria and other acute infections and such other abnormal conditions as those which are seen in adults.

In this chapter only the diseases of the peripheral nerves are considered.

Neuralgia is rare during childhood, and in those cases in which it seems to be present it is probable that a mild neuritis is the condition actually present.

#### MULTIPLE NEURITIS

(Polyneuritis)

This neuritis is an inflammation of the peripheral nerves. It is not common during childhood.

**Etiology.** A family tendency to the disease is noted. The causes of neuritis usually give a name to the disease.

Toxic neuritis is due to some poison. Arsenic given for chorea is apt to cause this type of neuritis. Lead and alcohol are also causes. Lead poisoning from toys, carpets, wall-paper, water pipes, bullets used in cleaning nursing bottles and other articles which come in contact with the baby's fingers are not very rare. Neuritis may be the only symptom noted of this poisoning. Cachectic diseases are associated with neuritis and in this case also the neuritis is probably toxic.

Postinfectious neuritis follows diphtheria frequently, and other infectious diseases less often. This may be toxic in nature, or may be due to metabolic disturbances.

Rheumatic neuritis is due to the infectious agent in rheumatism, and is associated with other symptoms of that disease.

Neuritis due to cold, exposure and over-exertion is extremely rare in children.

Beri-beri, an epidemic neuritis, is rare in this country.

**Symptoms.** The onset may be gradual or abrupt. Fever may be the first or a later symptom; it rarely exceeds 101.5° F. Extreme pain and great tenderness over the course of the nerve trunks may be the first symptom, or the pain may be slight or not noticeable. Hyperesthesia, anesthesia, numbness, a sensation of weakness or other peculiar sensations may be present, with or without pain. Sensory symptoms in any area disappear with the onset of the paralysis.



Weakness of the muscles, usually those below the knee, is followed by paralysis of the flaccid type. The fore-arm muscles may be affected. The cranial muscles are very rarely affected. The paralyzed muscles atrophy and contractures usually develop. Ataxia and tremor are common symptoms.

In typical cases the paralyzed muscles give the reaction of degeneration and the reflexes are greatly diminished or lost.

Foot drop occurs when the extensors of the leg are affected.

Wrist drop results from the involvement of the muscles of the fore-arm.

Flail hand and flail foot are the result of the flaccid paralysis.

The differential diagnosis may present great difficulty. Landry's paralysis, poliomyelitis, compression myelitis, the muscular dystrophies and atrophies, scurvy and, in atypical cases, several other diseases must be considered in differentiation.

**Treatment.** The removal of all possible sources of the metallic or other poisons is the first factor in treatment. Correction of all abnormal conditions found, especially those which interfere with elimination, is necessary. The pain may be relieved by the application of heat or cold. It is necessary to use great care in this, since the skin which has diminished sensibility may be badly burned without arousing any sensations of excessive heat. Counter-irritation is to be avoided. Rest is essential.

Paralysis may be treated by the usual methods employed for lower neuron paralysis. In diphtheritic paralysis care must be taken to avoid cardiac complications.

After the paralysis has reached its permanent stage, even after atrophy has become well advanced, it may be possible to restore the function of the muscles by nerve surgery. The amount of improvement to be secured in this way depends upon the anatomical relations and the skill of the surgeon.

**Prognosis.** Diphtheritic paralysis may affect the muscles of deglutition and respiration, or the heart muscles. Death is to be expected in these cases. In all cases, it is to be expected that several months will pass before recovery is complete. The paralysis is incurable when the nerve fibers have been destroyed. Recurrences are not uncommon in all except the post-infectious cases, and are occasionally found in these.

## NEURITIS OF THE BRACHIAL PLEXUS

(Obstetrical Paralysis; Erb's Paralysis or Palsy)

This form of paralysis has been mentioned with other lesions and trauma of the newly born. It is a paralysis, nearly always partial of the arm, and is caused by injury of the brachial plexus during birth. Spontaneous birth very rarely is followed by this paralysis.

The pressure of the forceps, a traction hook or the obstetrician's finger in the axilla or other less common obstetrical manipulations are the most common causes.

Probably it is a posterior subluxation of the shoulder joint that injures the brachial plexus more often than direct pressure. Subluxations of the cervical vertebra are nearly always associated with the other lesions. The condition is nearly unilateral; bilateral cases are rare.

Tissue changes include stretching and sometimes rupture of the nerve trunks, extravasation of blood into the nerve sheath, and the inflammatory reactions due to these injuries. The inflammatory process may involve the entire brachial plexus in serious cases, but usually only certain branches are affected.

**Symptoms.** When the upper portion of the brachial plexus is alone involved (Erb's paralysis) the deltoid, supinator longus, biceps, brachialis anticus and supraspinatus muscles are paralyzed. This is the most common type. The paralysis is of the flaccid type.

Later, neglected cases show the arm hanging helpless. The arm is rotated inward, the fore arm pronated and the palm directed outward. Atypical cases show different positions. The forearm and hand show no paralysis. Sensation is usually unaffected; sometimes anesthesia or hyperesthesia are present in the affected regions. The paralyzed arm is colder than normal and some atrophy develops. The electrical response is subnormal and the reaction of degeneration is sometimes present.

Klumpke's paralysis is a less common variation of brachial paralysis. The lower part of the brachial plexus is then injured, and the muscles of the hand and forearm are paralyzed.

The entire brachial plexus is very rarely injured. All degrees of paralysis, involving the entire arm and hand, are to be found in these cases. In these cases the humerus or the clavicle is often fractured, the epiphyses separated and the shoulder joint dislocated.

The diagnosis is easy. When the child first comes for examination when two or three years old, the condition suggests poliomyelitis. The history should differentiate. The paralysis is not situated in the same manner in poliomyelitis.

**Treatment.** Careful obstetrical procedures rarely are associated with this paralysis. When the new-born child is carefully examined, the condition is recognized. In certain cases the paralysis is associated with rigidity of the cervical muscles, edema and tension of the tissues and subluxation of the first rib, the clavicle or the humerus. By means of gentle manipulations these conditions can be corrected immediately. The paralysis may then disappear within a day or two. When the nerve trunks have been definitely injured, it may not be possible to relieve the tension of the tissues immediately.

In that case further manipulations are contra-indicated. The nurse should avoid moving the affected arm.

When the child is about two weeks old, according to the condition found on examination, further treatment should be initiated. The tissues should then seem normal, except for the atony of the paralyzed muscles. All inflammation should have subsided. Gentle massage, passive movements, gentle but swift rubbing of the skin over the shoulder and the back and care in dressing and bathing the baby should lead to rapid improvement. Any lesions found on examination at that time should be corrected. Dislocation of the shoulder may avoid recognition unless great care is used in examination.

Contractures may be prevented, in part, by the use of splints. Gentle and carefully graded exercises should be outlined, as the muscles begin to show increased tone. Faradic stimulation may help to preserve the tonicity of the paralyzed muscles. This or the galvanic current may be used with a certain amount of success in old cases.

When it is evident that the nerve trunks concerned are definitely destroyed, and the child is ten or more years old, the propriety of nerve grafting should be considered. In selected cases the nerve trunks may be dissected out from scar tissue about the brachial plexus.

In all conditions, at all times, the spinal column, especially of the upper thoracic and cervical region, should be kept in the best normal structural condition.

**Prognosis.** With early recognition of the condition and immediate treatment, or with treatment postponed not later than the first month or two, the prospects are excellent for complete recovery in typical cases. In more serious cases, recovery is complete or partial, according to the amount of injury suffered by the nerve trunks. These may, later, be treated by orthopedic surgery and recovery be almost complete. In very serious cases, it may not be possible to secure more than partial usefulness of the arm.

## PERIPHERAL FACIAL PARALYSIS

(Bell's Palsy or Paralysis)

The seventh cranial nerve may be injured after its emergence from the stylo-mastoid foramen, or during its passage through the petrous portion of the temporal bone, or within the cranium after its emergence from its nucleus.

Pressure of the forceps during birth or as the result of other pressure conditions, surgical injury during the removal of abnormal cervical lymph nodes, inflammation of the upper lymph nodes or of the parotid gland or a blow may cause definite injury to the facial nerve with resulting neuritis and paralysis of half the face.

Within the canal it may be affected by middle ear disease or by caries of the petrous bone.

Within the cranium it may be affected by meningitis, encephalitis or tumors.

Sudden chilling of the face and temples has been reported to be responsible for facial neuritis, and this is called "rheumatic".

The tissue changes in the nerve and the muscles innervated by the affected part of the nerve are those of neuritis anywhere in the body.

Symptoms vary according to the location of the part of the nerve injured. Obstetrical cases (due to forceps or pressure during birth) show loss of power of the muscles on one side of the face. The forehead does not wrinkle, the eyes do not close, the corner of the mouth is not moved in smiling or crying, the cheeks remain smooth and flabby. Crying or laughing causes the muscles on the normal side to pull the mouth toward that side.

"Rheumatic" paralysis and that due to middle ear disease or other cause of injury within the bone cause paralysis of all tissues innervated by the facial nerve. Slight disturbances of taste and of the secretion of saliva may be associated with such injury, though during infancy these symptoms are rarely recognizable.

Without regard to the site of the nerve injured, the paralysis is flaccid, reflexes are lost, the muscles give the reaction of degeneration and, later, atrophy takes place.

**Treatment** includes the correction of such neck lesions as may be found on examination, and the maintenance of normal conditions of nutrition. In those cases due to injury of the nerve during surgical operations it may be possible to repair the nerve. In other conditions in which there is a certain amount of the nerve trunk left intact peripheral to the stylo-mastoid foramen, some repair may be possible. When the injury is within the canal or the cranium, there may be some recovery of facial tone through nerve surgery. None of these methods is applicable in obstetrical cases.

**Prognosis.** Recovery usually occurs within two weeks after birth, in obstetrical cases of facial paralysis. In cases due to exposure, recovery may be delayed several weeks, but is usually complete. When the nerve has been injured by disease within the cranium, the prognosis is bad for recovery. After section of the nerve by surgical operations on the neck, recovery is prolonged.

#### FACIAL HEMIATROPHY

This is a rare condition, probably due to inflammation of the Gasserian ganglion. An atrophic spot first appears, usually on one cheek. This is followed by gradually progressing atrophy of the muscles and other tissues of one side of the face. Skin, subcutaneous tissues, fat, muscles and bones share in the atrophy. Usually one side alone is affected. The deformity is less in the rare bilateral cases.



Pain may precede the atrophy, but is not common nor severe. No paralysis occurs, since no motor nerve is implicated. Great weakness may result from the atrophy, but the amount of movement possible in an atrophied muscle is sometimes surprisingly great. The electrical reactions of the affected muscles remain normal.

Treatment includes the removal of all lesions of the cervical vertebrae, the upper ribs, the occiput and the clavicle. These are always found in such cases. The progress of the disease may be impeded in all cases, but only occasionally is it completely stopped.

### TUMORS OF THE PERIPHERAL NERVES

Tumors affecting the peripheral nerves are rare at any time of life, and are especially rare during childhood. One type of neoplasm is of considerable importance.

Neurofibromatosis (von Recklinghausen's disease) is characterized by the appearance of many subcutaneous tumors, tumors upon the nerve trunks or the nerve roots, and in some cases small pigmented areas upon the skin. When these tumors are upon the nerve trunks they may cause no symptoms at all, or there may be some faint symptoms whose import is unrecognizable. When they grow upon the roots of the spinal cord or upon the cranial nerves they may cause very severe symptoms referable to injury of the affected nerve fibers, and thus may be fatal. The cutaneous tumors are annoying and may cause pressure symptoms, but produce no serious symptoms otherwise.

No treatment is of any use. The prognosis is usually good for life, unless the cranial nerves are affected. Recovery has not been known to occur in any case.

## PART X. DISEASES OF THE SKIN

(Dr. Whiting)

The skin is subject to various abnormal conditions which are due to abnormal conditions within the body or to external irritations or infections. The appearance of the skin may suggest the diagnosis of certain internal diseases.

### DISCOLORATIONS

Jaundice is due to obstruction of the bile ducts. The pathogenesis is considered with the diseases of the liver.

Yellowish discolorations of the skin may be due to the excessive use of colored foods, especially spinach and carrots. For some reason, not yet well understood, certain children are unable to eliminate the coloring matter of these vegetables, and this accordingly accumulates in the blood (carotinemia) and stains the skin.

Brownish spots (moth spots) may be due to disturbed metabolism. Their pathogenesis is not understood. They occur in poorly nourished children rather frequently, and they disappear with the treatment which leads to better nutrition. Bronzing is characteristic of myasthenia gravis.

Pallor may be due to almost any cause of ill health, in children. It is especially marked in aplastic anemia.

Various greenish and yellowish tints are found in the skin of children suffering from the anemias, leukemias and nephritides.

The bronzing of the skin over the knuckles in rickets is diagnostic.

### SUBCUTANEOUS EMPHYSEMA

Rarely air gains entrance into the subcutaneous connective tissues. The condition is characterized by swelling of the skin; this is easily depressed by slight pressure, and a peculiar sense of crepitation, due to the passage of the air through the meshes of tissue, can be felt. The air may continue to accumulate and the swelling thus may spread over considerable areas of the body.

The air always gains entrance by way of the respiratory tract, during the phase of positive pressure due to expiration. This air, higher than atmospheric pressure, passes through any convenient orifice into the connective tissue. Fracture of the orbit may permit air to enter by way of the sinuses. The trachea may be injured by ulcers, tracheotomy, or in other ways, and thus the air gain entrance into the tissues of the neck. Tubercular or other disease of the lung, or the use of an exploratory needle, may permit the air to enter the extrapleural tissues and thus the subcutaneous tissues of

the thorax become emphysematous. The air may reach the mediastinum, by way of a tubercular or other abscess, and thence it reaches the tissues of the neck; the air may then spread into the subcutaneous tissues of all, or nearly all, of the body.

This condition is not in itself especially harmful, but its presence indicates a solution of continuity of the respiratory tract. When this is due to ulcers or abscesses the prognosis becomes very gloomy, and death may occur very shortly after the emphysema is noticed. When the emphysema is due to direct injury, in which healing may occur, the air is absorbed within a few days to ten days, and no ill effects are produced.

### EDEMA

Edema of the skin is not a rare condition, a symptom of disease of the kidneys, heart, or blood, or of other variable disease.

**Fetal edema** is due to maternal cardiac or renal disease, or to abnormal structure of the placenta. Various deformities are usually associated with the edema.

**Edema neonatorum** is characterized by the occurrence of edematous areas, usually small, over the body. These appear within a few days after birth, and disappear within a few days or a week. They require no treatment and do not seem to be harmful. Probably some disturbance of the kidneys is responsible.

**Cardiac edema** is less common in children with defective hearts than it is among adults with lesions of comparative severity.

**Angioneurotic edema** is mentioned in the chapter with urticaria.

**Idiopathic edema**, often very persistent, occasionally occurs during childhood. The edema may be localized in small areas, or may affect a considerable proportion of the body. Rarely there is general anasarca with ascites and hydrothorax, all with no recognizable cause, or the condition may be inherited.

Elephantiasis is very rare in this country, but may occur; it may greatly resemble a persistent edema.

Tetany is often accompanied by edema of the hands and feet, perhaps due to pressure, perhaps due to the underlying constitutional dyscrasia to which tetany seems to be due.

**Marantic edema** is found among babies and children suffering from diseases of metabolism, such as marasmus, rickets, and other serious conditions. The edematous areas are cold, may be clammy, and they pit easily.

Purpura hemorrhagica and other purpuras, severe gastrointestinal diseases, nephritis, and any type of anemia may be associated with edema, either local or general.

Certain infectious diseases may cause edematous areas. Measles is more apt to cause edema of the face; pertussis causes edema most noticeable, usually, around the eyes; erysipelas is associated with slight edema during the acute attack, but edema may appear after the erysipelas has disappeared, at irregular intervals.

Many of the diseases of the skin are associated with edematous areas, usually small.



## CHAPTER LXXVIII

### CONGENITAL DISEASES OF THE SKIN

Deformities of the skin are probably caused by factors related to those which cause deformities of the other tissues of the body. In the congenital skin diseases there is a deformity, and this, after birth, is a cause of further skin defect. It is evident that the skin which is imperfect in structure cannot perform the normal functions of skin. Like other deformities, those of the skin are often hereditary or familial.

#### ICHTHYOSIS

(Fish-skin disease; Xeroderma; Xeroderma ichthyoides; Ichthyosis congenita; Keratoma diffusum; Harlequin fetus; Alligator, hedge-hog, rhinoceros, or porcupine skin.)

This disease is really a deformity; it involves all layers of the skin. It may be found at birth or may not be noticed for a year or two. It is characterized by dryness and harshness of the skin, scalliness of various degrees, and various degrees of papulation, sometimes resembling warts, horns or other excrescences. Several types of varying severity are recognized.

**Ichthyosis simplex** (True ichthyosis; Xeroderma; Xerosis) may be so mild as to remain unrecognized. It shows simply an increased dryness and increased desquamation of the extensor surfaces and the back. All intermediate grades are recognized, with increasing size and hardness of the scales, increasing depth of the skin lines, and increasing areas of skin involved, until almost the entire body is covered with scales and quadrilateral plates of horny material, and these are variously separated by fissures of varying depths. The face is covered with smaller and softer scales. The skin may be so thick and harsh as to interfere with the movements of the joints, and the scales may assume various tints of brown, green and gray. Such individuals form the circus types, the "alligator boy", "the human porcupine" and so on.

**Ichthyosis hystrix** is characterized by the patchy distribution of the lesions, though still chiefly upon extensor surfaces and the back, the translucent, shiny, large, quadrilateral scales, and their deep color,—sometimes they are quite black, and are often brown, gray or green in color. Hair and nails are dry and brittle. Sweat and sebum are deficient. Fissures may be very deep and painful. The skin deformity is so marked that the terms *serpentina*, *sauroderma* and *scutella* have been applied to this form of ichthyosis.

Both these types are worse in cold weather and improve greatly during the warm, dry summer; the milder forms may completely

disappear during warm weather. Both are subject to eczematous inflammations, especially when the weather is cold or the skin irritated.

### **Congenital Ichthyosis**

(Ichthyosis congenita; Keratoma diffusum; Intrauterine ichthyosis)

This is usually a very serious condition. The child is often prematurely born; the skin is covered with harsh dry plates separated by deep grooves. The nose and ears may be scarcely recognizable on account of the thickened skin and the abundance of exfoliated epithelium. Rhagades may be very deep. The eyelids are everted (ectropion) and the mouth and other orifices of the body are variously drawn and fissured. The deformities lead to the name "harlequin fetus". Less serious cases show merely the skin scales, which may not be very harsh or conspicuous. The usual frequent bathing and warm dress of tiny babies cause the scales to disappear, in the very mild cases, and no further harm is noted until the child is old enough to be exposed to cold, and the bathing is less frequent. Then the disease appears, and the further history is that of the simplex or the hystrix types of ichthyosis.

**Etiology.** All forms of ichthyosis are congenital, and are a deformity of the skin. The exact nature of the tissue changes is unknown, and the real causes of this deformity, as is the case with other deformities, are not well known. It is known that anything which affects adversely the character of the maternal blood or its circulation through the pelvic tissues increases the proportion of deformities among the offspring. In experimental animals the skin is often so affected, though typical ichthyosis is not found among animals.

**Diagnosis.** The diagnosis rests upon the presence of the scalliness, the lack of constitutional symptoms, and the secretory changes in the skin; the fact that the disease is extremely resistant to treatment, so far as recovery is concerned, is usually not necessary for diagnosis. No other skin disease resembles ichthyosis.

Babies with congenital ichthyosis require great care to keep the body temperature normal; they require the care given premature babies.

**Treatment.** Softening of the scales is the chief factor in treatment. Frequent bathing in soft warm water, sometimes with abundant soap, thorough rinsing of the skin, thorough drying, and then the application of oil, vaseline or any other softening lubricant is helpful. Any disorders of nutrition should receive attention.

General treatment, especially of the lower thoracic and upper lumbar centers, is usually indicated. By this the emunctories are kept as nearly normal as possible, and thus toxemia is prevented.

The diet should be very rich in vegetables and fruits. Babies must have milk; human milk is urgently required for the congenital cases. They should be given vitamin-containing foods also, without regard to prematurity or age. Orange or tomato juice, well diluted, provides the vitamins. Runabouts and older children should not be given any meat or meat juices or broths, no fowl, fish or shell fish. Eggs are forbidden, and the amount of milk kept as low as is consistent with normal nutrition.

These children must not be allowed to gain in weight above that normal for the age and height. Deficiency of the thyroid has been found in some cases, and the administration of thyroid extract gave relief.

**Prognosis.** Babies born with ichthyosis usually die, but may live and remain subject to the disease. The older the child when the disease becomes recognizable, the less serious is it apt to be. Complete recovery is not to be expected, but with care marked improvement can be secured. The disease tends to increase slightly in severity and in extent until puberty; after that age it usually remains at about the same grade and extent throughout life. It does not interfere with life or health when the first symptoms are noted after the age of two years, and the only harm is the ugliness, annoyance, and occasionally, the itching of the affected skin.

### **ERYTHRODERMIA CONGENITALE ICHTHYOSIFORME**

This is a rare disease, characterized by its resemblance to ichthyosis with erythrodermia. It is present at birth or appears within a few days. The skin resembles that of ichthyosis, but the skin of the flexor surfaces is also involved; the skin is very red, and there is a tendency to bleb formation during the first few months of life, and sometimes for the first few years. Sweat is deficient except upon the palms and soles; these may show hyperidrosis, or may be keratotic. Itching may or may not be noted. The general health is not affected by the disease. Later in life the redness may disappear, leaving what seems to be a typical ichthyosis. There is no hereditary factor. The treatment is that of ichthyosis. Recovery is not to be expected but improvement is possible. Life is not shortened by the disease.

### **CONGENITAL APLASIA**

This is the congenital absence of some one or more areas of skin. At birth the condition is not recognized, but the skin disappears within a few hours or a few days. A very fine, delicate membrane covers the underlying tissues. This may present hemorrhagic points, but does not bleed. Subcutaneous fascia and fat are absent also. The deformity is probably due to adhesions between the fetus and its membranes.

### CONGENITAL HYPERKERATOSIS

This is a rare congenital abnormality of the skin characterized by hardness of the skin. This seems not only inflexible but also too small for the size of the baby. The folds are often cracked and bleeding. The fingers and toes are shorter than normal, and are held in a position of semiflexion by the tight skin. The lips are stiff, and the mouth cannot be closed. Sucking and swallowing are usually impossible. Respiration is difficult. The temperature of the body is maintained with difficulty. Death is inevitable in serious cases.

Even more rarely a child is born with less severe keratosis, and life may be maintained by oil rubs, the care given premature infants, and very careful feeding. The skin may attain fairly normal appearance, or it may remain hard and reddened throughout life.

Dyskeratosis is distinguished from congenital ichthyosis by the distribution and the nature of the changes in the skin.

### MONGOLIAN SPOTS

Bluish or gray spots may be found, usually over the sacrum, in about 90% of Mongolian children. The spots are half an inch to an inch in diameter, and are usually round or roundish in form. Two spots, symmetrical in size and location, are usually present. They are due to an accumulation of pigment in the deeper layers of the skin. These spots often are found in children with both negro and Mongolian blood. They may be congenital, or may appear within a few days after birth. Their color does not disappear with pressure.

Rarely such Mongolian spots are found upon children of Caucasian parentage, and they suggest no suspicion of negro or Mongolian blood. The occurrence of these spots bears no relation to Mongolian idiocy.

The spots have no significance, except that they may be mistaken for the lesions of purpura, ecchymosis and nevi. They disappear spontaneously by the time the children reach the age of seven years, or, rarely, a few years later.

### ADENOMA SEBACEUM

(Adenoma of the sebaceous glands; Vegetations vasculaire; Nevi vasculaires et papillaires; Pilosebaceous hydradenoma.)

This rare disease is characterized by the appearance of small tumors, usually upon the sides of the nose, but occasionally elsewhere upon the face or other parts of the body. Defective children are more often affected.

The tumors are composed of hyperplasia of the glands, with sometimes hyperplasia of epithelium and of connective tissue. Telangiectasis is always present, and the tumors are usually yellowish, brownish or bright red in color, according to the arrangement of the blood vessels.



They may be present at birth, or may appear at any time during the first decade. They increase in size and number very slowly.

**Treatment** is rarely required. They may be removed by electricity, if necessary. Surgical removal is rarely necessary. If the tumors are abundant they may be frozen with carbon dioxid snow for about a half minute, with resulting atrophy of the tumors and no ill effects upon the surrounding tissue.

## NEVUS

(Naevus; Nevus vasculosis; Nevus sanguineum; Capillary nevus; Nevus flammeus; Angioma; Portwine, claret, strawberry or mulberry mark or stain; Birth mark; Mother's mark.)

Nevus is a congenital deformity of the skin and subcutaneous blood vessels, red or purplish in color, present at birth or appearing within a few weeks after birth. Several types are described, which vary somewhat in tissue relations.

**Angioma simplex** (capillary nevus; angioma simplex hyperplasticum) is a common type of nevus. The surface is reddish, bluish or purplish in tint, slightly elevated above the surrounding skin, often lumpy or nodular. Usually the tumor is compressible. The color disappears upon pressure. This is often very small or not visible at birth, but it grows rapidly after birth. It attains the size of a small pea, or perhaps it may grow to several inches in diameter. Pulsation is sometimes visible. It increases in size when the child coughs or cries. After a few months it may undergo spontaneous regression; more often it persists indefinitely. If the surface is broken there may be profuse hemorrhage; occasionally the growth disappears after this, with simple atrophy of the nevus, or after sloughing. Scarring may be slight or marked.

**Angioma elephantiasis** (elephantiasis telangiectodes) is the condition present when angioma simplex is of great extent and when the lymph vessels also are greatly dilated.

**Angioma cavernosum** resembles angioma simplex, but there is great dilatation of the vessels, with some destruction of the adjacent vascular walls. It may result from injury to the angioma simplex, with cystic degeneration, or it may be congenital.

**Spider nevus** (nevus araneus) is often acquired, but may be congenital. This shows as a red dot surrounded by radiating red lines.

**Nevus simplex** (portwine mark or stain; claret mark or stain; nevus or naevus flammeus or flammineus) is congenital, and may increase in size after birth. It is usually flat, but may be elevated or of irregular nodular or verrucous surface. The color is due to the rather deep and considerably enlarged blood vessels. It may be almost invisible, or may be so large as to almost cover the face, neck,

or, rarely, other regions of the body. When the blood flows very slowly through venous-like sinuses the term "venous nevus" (*angioma varicosum*) is applied. When the surface is very nodular and rough the term "nevus tuberosus" is employed. The term "mulberry nevus, or mark" is applied to the growth when there are elevated or fungoid masses, somewhat resembling a mulberry or a strawberry. The "strawberry mark" may be of this type, or may be a simple flat mark of strawberry tint.

**Pulsating nevus** is a birthmark in which pulsation is marked; it may be easily visible.

**Nevus pigmentosus** (mole; pigmentary mole; mother's mark) is a localized accumulation of pigment, associated with hyperplasia of the cuboidal cells of the skin and the connective tissue, often with one or several hairs. Several types are found, which vary somewhat according to the relative preponderance of hyperplasia, pigment and hairy growth. *Nevus spilus* is smooth, slightly elevated or not elevated, pigmented, single or multiple in number. *Nevus pilosus* is usually elevated, and it shows hairy growth. It may be very small, or may cover any considerable area of the body. The terms "linear nevus", "nevus nervosus", "papillome lineare", "bathing trunk nevus", "bathing drawers mark", "tippet nevus", or "cape nevus" describe the areas occasionally covered by this type of nevus.

### Etiology

Probably all types of nevus are based upon a congenital deformity of the skin and its blood and lymph vessels. The commonly accepted view among laymen, that the marks are the result of unpleasant maternal experiences has no basis in fact. Hereditary tendencies have been noted, especially in the pigmented hairy moles. Pressure conditions during intrauterine life have been considered responsible, and it is true that most birth marks are found in regions most apt to be injured by pressure. The causes of deformities in general may be responsible for these marks, or for the deformity of the skin tissues which might permit vascular, pigmentary or hairy abnormalities to be produced easily by other factors.

### Treatment

Treatment of the various types of nevus is not often satisfactory. Single hairs or small groups of hairs may be destroyed by the electric needle, or they may be pulled out as often as they appear. Larger hairy areas are rarely subjected to this method. When the hairs have been removed by electrolysis or the electric needle the pigment usually disappears at the same time. Pigmented moles may be destroyed by the electric needle, electric cautery, or may be cut out completely. A small scar is usually left by these methods.

When rapid growth is noted the nevus must be removed at once. Either surgical removal or the X-ray, skillfully employed, may be used.

Capillary nevus is often resistant to any treatment. The application of carbon dioxid snow for ten seconds to one minute may cause them to disappear. The nevus is frozen white, and a narrow erythematous ring surrounds the frozen tissue. The tissue thaws almost immediately, becomes red, and usually a small blister forms. Some slight discomfort may follow. Later some slight exfoliation or crusting appears, this drops off, leaving a small scar. It may be that too long an application of the snow, under pressure, may cause sloughing and some pain for a few days. Large areas should be treated in sections, in order to avoid too great irritation.

Liquid air is excellent for this purpose, but it is not so easily secured as is the carbon dioxid.

Electrolysis may be used also for vascular nevi. It is tedious and may be painful.

Excision of the abnormal skin is often successful. If the area removed is greater than a half inch in diameter, skin grafting should follow the removal.

The injection of irritating liquids into the nevus is not advisable under any circumstances.

Often the best method of meeting the condition is the habitual use of properly colored theatrical paint.

## CHAPTER LXXIX

### INFLAMMATORY DISEASES OF THE SKIN DUE TO EXTERNAL CONDITIONS

The skin is subject to injury from both sides; from nervous disorders and the toxins of the blood stream within and from environmental conditions without. On account of the great delicacy of the skin during childhood, and especially during babyhood, any irritation of the skin leads to marked injury. On account of the immaturity of the skin and its recuperative powers during infancy and childhood, lesions of the skin which seem extremely serious may disappear completely and speedily, when the source of irritation is removed. The diseases due to external factors will be first discussed, then those due to both external irritation and constitutional dyscrasia, then those due to abnormal conditions of the body alone, or with only such external irritation as is commonly present during infancy and childhood.

#### MILIARIA

(Prickly Heat; Lichen Tropicus; Sudamina; Red Gum; Strophulus; Heat Rash)

**Sudamina.** In this no inflammatory reaction is found. The sweat ducts are filled with epithelial cells, during a time when there is no recognizable perspiration. The sweat accumulates behind this obstruction, forming very tiny, pearly vesicles. These are absorbed by the lymph and blood streams, and, if the cause persists, are followed by other crops of the same type. This condition is associated with any long fever or malnutrition or exhausting disease. No treatment is required, and the condition terminates with the causative disease.

**Miliaria rubra** (Red gum; strophulus) is the result of excessive clothing. The sweat glands become occluded as a result of their inflammation, and this is due to the irritation of continued heat. The rash appears upon the cheeks or neck, and often upon the cheek which is subjected to pressure while the child is asleep, or the side of the face pressed against the mother's body while nursing, or against the body of any one who holds the baby too closely and too often in the arms. There is no itching or discomfort, and the rash passes away as soon as the excess of clothing is removed and the child is no longer held too closely in the arms.

**Miliaria Papulosa** is an acute, mildly inflammatory reaction of the skin with obstruction of the sweat glands, caused by heat, and most commonly found in children who are below par in some way. It may be due to too warm clothing, in winter or summer. The erup-



tion may be either papular or vesicular, but usually both papules and vesicles are present. The eruption is very abundant, and the papules are very small, with a conical shape, and sometimes the points are quite sharp, resembling somewhat the point of a pin. On the summits of the papules, or occurring independently, are tiny vesicles, filled with a clear fluid. Each papule or vesicle has a red areola. The skin around the areas of miliaria is reddened, and the eruption may increase in extent through the continued action of the causative factors.

With the eruption the itching and burning sensations are severe; this leads to further irritation. If the vesicles are thus ruptured, they may become infected and their contents become seropurulent, or even purulent. If the heat persists and the child scratches the lesion, or if irritating applications are employed for the relief of the itching, the miliaria may be followed by typical eczema. Boils are apt to be associated with these prolonged irritations. Crops of the eruption occur if the heat is not diminished.

**Etiology.** Extreme heat is the essential cause of the disorder, though debilitated subjects are predisposed. Those who sweat freely are especially apt to suffer.

There is little difficulty in diagnosis; the rough character of the papules and vesicles, the sudden appearance of the eruption and its speedy disappearance when the heat is diminished, and the lack of other symptoms, all make the disease easily recognizable.

**Treatment** is chiefly prophylactic. Children should not be overdressed at any time, and during hot weather they should wear only thin and scanty clothing. Frequent cool baths are useful. If possible, babies ought to be taken from a city during the hot weather. If this is impossible, plenty of cool baths, thin clothing, and a careful avoidance of constipation should prevent the disorder. The diet should consist of fresh vegetables and fruits, with enough milk to meet the protein requirements. Cool water should be abundantly given. Little babies should have the milk somewhat diluted; nursing babies may be given one or two ounces of cool sterile water before nursing. In artificial food, the fat and sugar should be somewhat diminished during very hot weather.

When the rash appears, cool bathing, in boric acid or soda solutions, made very weak, may give relief. Any sterile dusting powder may be applied after the bath. The most important thing is to take the baby from the heat as soon as possible. Even one day at the seashore may terminate the attack, and it may not recur if the heat is not too great.

Flannel garments should be removed, and soft cotton or silk substituted for them.

General treatment is indicated. This facilitates nutrition and elimination, and maintains good circulation of the blood.

With diminished heat, whether due to the weather or to clothing, the rash disappears speedily and the general health improves at once, if the rash has been long present. If infection has occurred, the lesion may be longer in healing, but the rash itself disappears with remarkable celerity.

### GRANULOSIS RUBRA NASI

This is a rare disease, found among children almost exclusively. The disease is limited to the front and the sides of the nose, rarely extending onto the upper lip.

The affected area is very bright in color, fading gradually into normal skin. Scattered over this bright area are papules and dots of dark red or brownish red, as large as the point or the head of a pin. The papules become pustular and then undergo desiccation. Both the bright red and the brownish colors disappear on pressure.

Hyperidrosis is marked over the affected area, and often over the surrounding skin. The disorder seems to be due to an inflammation of the sweat glands or of the perivascular tissues affecting the sweat glands.

No cases have been reported under osteopathic treatment. No satisfactory treatment of any kind has been described. The condition disappears with the onset of puberty.

## DERMATITIS

Any inflammation of the skin is, in the strict sense, a dermatitis, but certain types of dermatitis have other names, as eczema, miliaria and others. Several distinct types of dermatitis are known, and these vary in severity according to the cause of the inflammation.

**Traumatic dermatitis** is due to injury of the skin. Any pressure, friction, blow, or other trauma may initiate an inflammatory reaction, and this is curative in nature. A tiny scratch of the skin, barely enough to injure the skin slightly, is followed by redness, swelling, pain and heat, though these may be very slight. These phenomena, typical of inflammation, are the conditions necessary to recovery. From this slight injury, gradations of traumatic dermatitis are found to the serious ulcers due to pressure upon devitalized areas, as in bed sores.

**Dermatitis actinea**, or sunburn, may be very severe. The milder cases consist in reddening of the skin, and this, if long continued, leads to increased pigmentation of the skin. If the exposure is long continued in one day, the dermatitis may be very severe; the subcutaneous tissues as well as the skin are swollen, the reddened area assumes a purple tinge, vesicles appear, these are followed by bullae and if infection occurs very serious ulcers may result. The pain is very severe, the day after sunburn, though there is no sensation at all while the exposure to the sun is causing the tissue changes of the skin.

**Dermatitis calorica** is due to long exposure to heat of mild degree. It is not common in childhood.

### **DERMATITIS CONGELATIONIS**

(Frost-bite; Chillblains)

This dermatitis is caused by exposure to cold. They occur most readily in children whose vitality is subnormal for any reason. Ears, fingers, toes, heels and nose are most easily affected, on account of their distance from the body and the custom of exposing the face and hands to the cold.

The exposed area loses sensation, and it soon becomes white and apparently bloodless. Soon after this whiteness, the tissues freeze completely, and then recovery is very difficult or impossible. Mild degrees of cold cause the area affected to become congested and of a dark red color. Treatment at this time results in speedy though not complete recovery.

**Treatment.** The injured part should be rubbed with snow or with rough cloths dipped in cold water until the circulation returns. This is followed by gradually warmer rubbing; this is accompanied by pain, sometimes very severe. The child must avoid much heat for several days, according to the severity of the injury. After such an experience, the child should be kept from exposure, warmer clothing must be arranged for outdoor wear, and care must be taken to see that the clothing is properly distributed over the body. The increased clothing must not be worn in a warm room, but must be assumed when the child is out of doors, or is exposed to cold in any way.

If bullae form they must be opened and dressed as is any blister. They are due to irritation of the chilled areas.

**Prognosis.** The frost-bite may disappear at once, or the tissues may remain dark in color and painful until warm weather appears. Whether the tissue seems to become normal or not, the pain and congestion are very apt to return or increase with exposure to cold, even for several years. (A child had frost-bitten heels in the middle west, was taken to Southern California and remained until adult life. When he returned to his native state, after twenty-three years, the chillblains immediately returned with all the old severity.)

### **DERMATITIS AMBUSTIONIS**

(Burns)

Burns vary considerably in severity and extent. Those of the first degree (erythematous) show redness, some swelling, increased heat and slight discomfort of heat and itching. Burns of the second degree (bullous) show these symptoms, and also vesiculation and the formation of bullae which vary in size and tension. Burns of the

third degree (escharotic) include these characters and also an actual destruction of tissue, usually with the formation of an eschar.

The constitutional symptoms depend more upon the areas involved than upon the actual severity of the burn. If any considerable fraction of the entire skin is involved, even in burns of the first degree, death is inevitable. The younger the child the smaller is the lethal fraction of skin involvement. The child may fall into profound shock when the burn is produced, and never regain consciousness. If the child lives for a day or more, very profound constitutional changes occur,—fever may be very high, vomiting and diarrhea be very severe, cardiac symptoms be marked, and pneumonia and bronchitis are apt to follow the burning. Eosinophilia is marked; nephritis is commonly not very severe, and there may be meningeal or cerebral symptoms.

**Treatment.** Many methods are approved. The mother usually applies lard and salt, soda and oil, dilute lead water, carron oil (linseed oil and soda water) or some other household remedy. Lassar's paste is good. Zinc oxide in castor oil has advocates. Browned flour or any aseptic powder may be used.

Paraffin preparations have received much recent approval. Several commercial preparations are on the market. The essential features of a paraffin preparation are that it shall be firm at body temperature, but not have too great solidity; a melting point of about 122° F. or 47° C. is practical. The following is advised by Stellwagon and Gaskell:

Paraffin (120-122° F.)	. . .	97.5 parts
Olive oil	. . . . .	2.5
Asphalt	. . . . .	4 drops

The paraffin preparation may or may not be antiseptic. It must be aseptic.

If the burned surface is covered with any bland ointment and this covered with paraffin paper the pain may be relieved and recovery be speedy.

If the burn is very extensive and shock profound, the patient may be immersed in a bath at about 100 or 105° F. The child may remain in the bath for an hour or two, and the temperature maintained at a steady temperature by the addition of small amounts of hot water at intervals. The child may then be taken from the bath and wrapped in linen or cotton wool for an hour or two, and then again placed in the bath.

Stimulating treatment is required for burns with shock, and analgesics may be necessary for any extensive or any serious burn.

Suppuration may follow burns of the second or third degree. The surface must be kept clean and the dressings frequently changed.



In severe escharotic burns surgical treatment is indicated. The removal of an eschar may be necessary, and skin grafts are often required.

**Prognosis.** Burns of the first degree, not extensive, heal very readily. Burns of the second degree, not extensive, heal well but after a few days' longer time. Burns of the third degree leave scars, and may cause severe crippling, according to the location. Burns of any degree, if extensive, may cause profound shock and speedy death.

### DERMATITIS VENENATA

This term is employed as including the eruptions due to any substance acting upon the surface of the skin.

**Etiology.** The poison due to *rhus venenata* (poison oak, poison elder, poison sumac, poison dogwood) to *rhus toxicodendron* (poison ivy) is by far the most common of these eruptions. The oil of the plant is the irritating factor. The droplets float in the air around the blossoming plant, and are in the pollen, but the most severe cases are due to contact with the leaves. The smoke from burning plants contains the oils, and some very severe cases of dermatitis have been found as the result of the patient's passing through the smoke. *Rhus diversiloba*, *rhus pumila*, and *rhus vernix* are less commonly found harmful. Chrysarobin, often used in the treatment of psoriasis, causes a dermatitis somewhat resembling that of poison ivy. Turpentine, carbolic acid, mercury, arnica, mustard, cantharides, dye-stuffs, tar derivatives, iodoform and iodine, all occasionally used in the treatment of skin diseases, may cause dermatitis venenata. Other plants which are poisonous only to those with an idiosyncrasy to them are nettle, primrose, smartweed, tomato plants, balm of Gilead, rue and oleander.

Surgeons eczema, nurses eczema, physicians eczema, are forms of dermatitis due to prolonged and frequent use of antiseptics.

**Symptoms.** These vary from an insignificant irritation to gangrene. The type due to poison ivy or poison oak may be taken as an example. Other types differ only slightly from this.

A few hours or a day after exposure the face and hands, or other exposed areas, present an erythematous rash, with or without swelling. Itching and burning may precede or may follow the rash, and may be extremely severe. The rash extends to other areas; the anal and genital regions are often affected, probably by way of the hands.

The erythematous rash increases, vesicles appear, and these increase in size and become confluent in some areas; the blebs thus formed may attain great size and may become ruptured, leaving areas of red, weeping surface. Infection often occurs, and the tissues become purulent. The itching causes scratching, and this increases the irritation, injures the skin, and makes the trouble much worse.

After a few days, in mild cases, the skin clears, the blebs disappear, often without rupture, and recovery is quickly complete.

In more severe cases, recovery may be much delayed, or may pass imperceptibly into chronic eczema.

Recurrence of the rash at about the same day of the month, one year later, and for successive years, has often been reported. It is very probable that these so-called recurrences are really unsuspected exposures.

**Treatment.** Prophylaxis is usually easy. Before going into any neighborhood in which poisonous plants may be present, the child should be washed thoroughly with soap, and this should not be rinsed off. The irritating oil is thus unable to reach the skin. Anointing the skin with vaseline mixed to a paste with soda is also advised. Washing the skin both before and after possible exposure with strong, hot soda solution is often effective in preventing the dermatitis. A bath with green soap or an abundant supply of any other penetrating soap taken soon after exposure may remove the irritating oil. If other solvents of the irritating oil are not convenient, the exposed surfaces may be bathed in gasoline. This can be taken from the tank of an automobile. All of these preventives depend upon their ability to dissolve and remove the irritating oil droplets.

After the dermatitis is recognizable, the treatment advised for eczema of about the same severity may be used. In other cases a solution of potassium permanganate may relieve the itching and burning.

Potassium permanganate crystals,	4 parts
Distilled water . . . . .	96 parts

This solution may be used freely. It leaves a brownish stain, and this may be removed, after the skin is normal, by bathing the discolored areas with a weak solution of oxalic acid or with diluted lemon juice.

Calamine zinc lotion, half-saturated solution of boric acid, weak solutions of soda, borax, or ammonium chloride may give relief. Very weak carbolic acid solution, 1:1000, may relieve the itching.

Any comforting lotion, except carbolic acid, may be frequently applied by bathing or brushing, or soft linen cloths may be soaked in the solution and laid over the affected areas.

In very severe cases without any skin abrasion a speedy rinsing of the affected parts with chloroform often gives comfort for several hours.

The powders, ointments and other lotions which may give relief in this condition are given with the treatment of eczema.

### DERMATITIS MEDICAMENTOSA

Skin eruptions due the use of various medicines are very common in families who use drugs freely, and these eruptions are often puzzling to the osteopathic physician, since the mother so often fails to acknowledge the use of the drug to the doctor whose disapproval she fears. Nurses are also at fault sometimes; even the mother may not be aware that the child is receiving quieting drugs given by the nurse. Nearly every eruption due to a drug is found in children with an idiosyncrasy against that particular drug or class of drugs.

The drugs which often cause eruptions are many. Arsenic causes complex and variable eruptions, erythematous, papular, bullous, pustular, urticarial or hemorrhagic. Arsenic may be derived from painted toys, colored fabrics, the emanations from colored wall paper, and occasionally from medicines prescribed for skin disease, anemia or other abnormal conditions. Belladonna or atropin cause an eruption resembling that of scarlet fever; more rarely the eruption is patchy and erythematous. Gangrene of the scrotum is rare, but occasionally occurs. Chloral, digitalis, any of the opiates, quinine, the salicylates, and many of the coal-tar derivatives cause erythematous, urticarial or papular eruptions which may be diagnosed with difficulty. The iodides and bromides cause various lesions, most commonly those resembling acne, but often papilomatous or pustulopapillomatous eruptions may be found. Less commonly, and usually in individuals who have employed the drug a long time, scaly spreading sores suggestive of the syphilitic skin may be found. Children occasionally show peculiar plaques composed of many or few red or purple papillomatous or condylomaform growths; these may be pustular or crusted, and rarely may present ulcerated areas. Both bromine and iodine may reach the child by way of the mother's milk, if she is taking these drugs. The eruptions due to iodine and bromine persist for some days after the drug is discontinued.

The serums employed in the treatment of diphtheria and other diseases often cause various rashes. These resemble those associated with anaphylactic phenomena. These eruptions may appear within the first day after the injection of the serum, or may not be found until several weeks. Fever, headache, pain in the joints and prostration are usually associated with the skin symptoms. Asthma, cardiac disturbances, paralysis and other serious constitutional symptoms may lead to death, though not very commonly.

The rash is usually urticarial, and giant urticaria may be found. In other cases the eruption resembles that of erythema multiforme, measles, scarlet fever, urticaria or angioneurotic edema. Vesicles, bullae, papules, and edema of the skin are less common; purpuric eruptions are rare. Itching is usually rather severe.

**Treatment.** A bath in warm soda water may relieve the itching. Solutions or ointments of carbolic acid, glycerine, lime water, vaseline or zinc oxide may be employed for the relief of the itching.

The eruption usually passes away within two days or so, if the child lives.

### ERYTHEMA SIMPLEX

This is a mild case of skin injury. Erythema solare (sunburn) is a reddening of the skin after exposure to the sunshine for a short time. Greater exposure produces a dermatitis. Erythema venenatum is due to the action of strong soaps, mustard, liniments, and other causes of slight reddening of the skin, not so severe as to produce dermatitis. Erythema pernio is due to exposure to cold. Autointoxication or certain drugs may cause erythema; more severe effects include the forms of dermatitis. The redness disappears on pressure.

The removal of the causative factors is usually followed by recovery. If the burning or itching is uncomfortable, any non-irritating lotion, dusting powder or ointment may be applied. The skin returns to its normal condition within a day or a few days.

### ERYTHEMA INTERTRIGO

(Chafing)

This form of erythema may be an early stage of eczema, or it may not terminate in that disease. It is characterized by redness with some burning and discomfort, and is found only upon those areas of the body in which the skin lies in folds. It is caused by friction and irritation; accumulating sweat may keep the surfaces moist, and erythema intertrigo result. Most commonly, in babies, it results from the presence of soiled or wet diapers. The buttocks, genitalia and neck of a fat baby may show erythema in warm weather, even though the clothing and the skin may be kept clean very scrupulously. The skin may show maceration and the desquamation be marked, or infection may result in the development of boils or abscesses, or develop into true eczema.

Ammoniacal diapers may cause great irritation with erythema intertrigo. These seem to be due to the presence of soap or washing powders left in the diapers by scanty rinsing.

Lack of cleanliness or excessive washing of the affected parts with too much or too strong soap, or imperfect drying of the skin may cause erythema intertrigo, and occasionally irritating dusting powders cause the same condition.

Babies with gastrointestinal disorders suffer from erythema intertrigo upon comparatively insignificant irritations. Children who are older suffer from damp, wet clothing, gastrointestinal disorders



and uncleanness in about the same way, though they less often suffer from excess of soap or imperfect drying of the skin.

If the baby has too much sugar or too much fat in the food the stools are apt to become irritating, and this may cause intertrigo before the nutrition of the child is affected.

Diagnosis is easy in the erythema stage. Later the eczematous state may give some difficulty. Eczema is more uncomfortable than erythema, and the eczematous exudate stiffens and stains the clothing.

**Treatment.** The cause of the irritation should be found and removed. Excess of fat or of sugar in the food must be corrected. Diapers must be well washed, and rinsed even more carefully. Diapers should be changed as soon as they are wet or soiled. Bathing with mild soap must be followed by very thorough rinsing of the skin, thorough drying with soft cloths, and the application of any non-irritating dusting powder. The affected parts should be kept from contact by soft cloth, absorbent cotton, or a flat bag made of thin soft cotton material and filled with dusting powder. Any such dressings must be removed as soon as they are damp or soiled.

Powders prevent friction of opposing surfaces and thus relieve the irritation. Rice flour, cornstarch, bismuth subnitrate, or wheat flour which has been browned in the oven until it is light brown in color and very soft may be used for this purpose.

Powders and ointments must not be used at the same time. It is an unfortunate custom for nurses to apply ointment, then to cover this thickly with powder. A very irritating, crusty mass results from this custom, which perpetuates the skin irritation and makes recovery very difficult. Powders are good; ointments are good; but ointments with powders are extremely irritating.

Ointments may be applied to prevent the affected skin from being irritated further by the discharges. Zinc oxide ointment, Lassar's paste, 5% boric acid ointment, cold cream or other non-irritating greasy ointments may be used for this purpose. Usually it is better to avoid the ointments unless the discharges are very frequent or very irritating.

**Prognosis.** Recovery is to be expected at once upon the removal of the irritating factors, in early cases. If the skin has become much softened, it may require several days before the skin becomes normal. In later stages, when the skin is really eczematous, the treatment and prognosis are those of eczema.

## CHAPTER LXXX

### ECZEMA

Eczema is a catarrhal inflammation of the skin, characterized by erythema, vesicles and papules usually with abundant exudation and associated with marked itching and burning.

**Etiology.** The disease is due to irritating factors, which may be within the body or external to it. The disease sometimes seems to be hereditary, but it may be that only the skin structure which is less invulnerable than normal is inherited.

Families in which rheumatism, gout, asthma or diabetes mellitus frequently occur usually include also many individuals with eczema. In some cases eczema seems to substitute for other disorders.

Digestive disturbances are common causes of eczema in babies or larger children subject to the eruption. Excessive food which is well-balanced, or improperly balanced food also cause it, probably both by the toxemia and the nerve irritation. During the first year excessive fat is often responsible; fat breast-fed babies are especially subject to eczema, on account of the high fat in the mother's milk. Less commonly the eruption is due to excessive sugar in the food. After the first year, children who have excessive starch in the food often have eczema.

Other internal sources of skin irritation are constipation, any of the nephropathies, subnormal water intake, or the eating of certain foods to which the child is sensitive. These idiosyncrasies, so called, are probably always anaphylactic. A breast-fed baby may be sensitized to some constituent factor of the mother's milk, and recovery then follows the elimination of some one or more articles of food from the mother's diet.

Anything which causes toxemia of any type may cause an attack of eczema, or may perpetuate a pre-existing attack, in children who are subject to the disorder. According to Czerny, eczema is simply one manifestation of the "exudative diathesis". This means simply that there is a constitutional peculiarity which so modifies the metabolism of certain individuals as to cause them to suffer from eczema, asthma, catarrh and other disorders.

The external causes of eczema include mechanical, thermal or chemical irritants. Scratching, rough powders, rough clothing, woolen or starched clothing, tight clothing, excessive friction during the bath, these are the most common mechanical causes. Exposure to too great heat or cold, and especially long-continued exposure to cold, very often causes eczema in children who do not seem especially predisposed. Strong soaps, alkaline or acid dusting powders or perfumed powders, irritating bowel discharges, acid or ammo-

nical urine, especially if the diapers are not changed frequently, and improper applications for the relief or prevention of skin disorders are common causes of eczema.

It is evident that none of these factors acting alone is sufficient cause for eczema, since many children who suffer from these same dietetic and hygienic improprieties do not have eczema. The essential factors are not known. It is uncertain, also, whether the skin irritation is due to toxins within the blood circulating through the skin, to the effects of nervous disorder, itself caused by the toxemia, or whether some other cause as yet unsuspected, is at the root of the trouble.

### Types of Eczema

The symptoms vary with the type of eczema present in any one case. Intermediate and mixed types are frequently present. Three types are especially common among babies.

**Eczema rubrum** (vesicular eczema, pustular eczema, acute exudative eczema). This type is the most common of all, among babies. It is usually found upon the face, but may appear in any part of the body. The scalp may be severely affected. Redness, swelling and edema, exudation of a sticky substance variable in amount, and tiny papules appear upon the affected area. The papules may coalesce, and the exudate become abundant. The scratching of the skin leads to bleeding, and often to infection with pyogenic bacteria. Pustules then are formed. Upon the face the drying exudate, with or without the blood and pus, forms crusts which may be very thick and hard (eczema crustosum). Removal of the crusts leaves a raw, bleeding surface from which a new exudate soon forms a new crust. Crusts are occasionally but not often found upon other parts of the body than the face. The lymph nodes which drain the affected area are usually enlarged. Thin babies or poorly nourished children are rarely affected with eczema rubrum.

Large or small pustules follow the growth of any of the pyogenic bacteria (pustular eczema; impetiginous eczema). Young babies are much more prone to infection than are older children. The itching is less severe when this occurs. Constant re-infection perpetuates the disease. Other children may become infected.

In mild cases of eczema rubrum there may be only mild itching with slight redness, swelling and scaliness of the skin. Desquamation is somewhat increased, and any attempt to remove fully the scaly epithelium leaves a bare, reddened and sometimes bleeding surface.

**Papular eczema** (lichen simplex; eczema lichenoides; lichen eczematodes). This is chronic or subacute, affects the trunk or upper extremities, and very rarely affects the face, ears, hands or feet.

The affected areas are reddish in color and are sprinkled or covered with small papules; these may be surmounted by a tiny vesicle. Desquamation is usually pronounced. Around the definitely papular areas a number of discreet papules are scattered around. The eczema may or may not spread, and several areas may or may not be simultaneously affected.

Itching is usually severe. It is common among infants and young children, and may be found at any time of life.

**Eczema intertrigo** (eczema mucosum) follows erythema intertrigo already described. Wherever skin surfaces are in contact, so that there is constant moisture, this eczema is apt to occur. Lack of cleanliness, imperfect drying after the bath, the use of rough powders, and especially the constant presence of wet or soiled diapers may cause intertrigo. The skin becomes excoriated, inflamed and an exudate resembling that of eczema rubrum is found. Crusts, vesicles and papules are very rarely found. The itching and burning may cause suffering, though sometimes areas which seem to be very severely affected may not cause any apparent discomfort to the child.

Other types occur during life, and approach the adults types as children approach puberty. Exudation varies. **Moist eczema** (eczema humidum; moist tetter; salt rheum; weeping eczema) is characterized by the abundant exudate. Very abundant exudate is suggested by the term eczema nadidans. **Dry eczema** (eczema siccum; dry tetter) shows little or no exudate, and desquamation is abundant. Eczema ichorosum is characterized by a profuse purulent discharge, following pyogenic infection.

**Eczema erythematousum**, found often upon the face or hands of elderly persons, is scarcely to be found in childhood.

**Follicular eczema** is found associated with the follicles of the skin.

**Eczema universale** is rare. It begins with malaise, light chills and feverishness or fever. Plaques appear which are first erythematous and later eczematous. These plaques spread and become confluent, so that almost the entire body is covered. These disappear within a week or a few weeks. The acute stage passes into a subacute or chronic eczema of the legs; or the eczema may disappear completely.

**Eczema sycosiforme**. Eczema affecting the hairy parts of the body is called eczema sycosiforme. It is not often present in children. The term does not apply to the eczema pussulosum of infants, in which the scalp may be seriously affected.

**Eczema fissum** (fissured eczema; eczema rimosum; eczema rhagadiforme). This type is characterized by fissuring or cracking of the skin, usually a part of squamous or erythematous eczema. The



fissures usually persist through cold weather, and may or may not disappear during the summer.

Chapping of the hands (chaps) is a very mild type of eczema fissum.

**Crackled eczema** (furrowed eczema; eczema craquele) is characterized by a dry surface variously crisscrossed by superficial cracks, extending only to the rete. The epiderm may be slightly curled up at the edges of the cracks. The appearance suggests that the skin is too small and has cracked. China which has been heated too much sometimes shows crackles of similar design. This type is more common among neurotic children nearing puberty, but may be found at any age.

**Eczema sclerosum** often follows squamous eczema. The affected areas are somewhat elevated, thickened, hardened and sometimes rather horny. The edges may or may not be sharply defined. When the palms or soles are affected, any sudden flexing of fingers or toes may cause deep, intractable fissures. Eczema tylositicum is a form of eczema sclerosum in which the palms and soles are chiefly affected. In eczema verrucosum the surface of the thickening is rough, uneven or papillomatous, resembling small warts.

**Squamous eczema** is usually secondary to other types, and it may be associated with any of them. The affected areas are red and scaly, with abundant desquamation. The edges fade gradually into normal skin. It is a persistent type. When the areas are somewhat circumscribed and resemble psoriasis the term eczema psoriasiforme or psoriatic eczema. When the skin near the joints are affected, fissuring is frequent and sometimes persistent. Itching may be mild, intense, or be associated with burning.

**Parasitic eczema** (eczema parasiticum) is sometimes applied to eczema in which the affected areas are circumscribed and arranged in patches. Probably it is better to limit the term to those cases in which the irritation caused by parasites and the scratching associated with them causes eczema of any form. Ringworm may cause such an eruption (eczema marginatum). Other fungi, or fleas, lice, wood-ticks, and jiggers may cause such an eczema if the irritation persists.

### Treatment

Since digestive disturbances are so often at the root of eczema, treatment should be devoted to the splanchnic centers. Often definite bony or muscular lesions are found to be affecting digestion adversely. These should be corrected as soon as is possible. It may be that during several treatments necessary to these corrections, the eczema increases in severity. This should lead to increased effort to secure complete correction.

Especial attention should be paid, also, to lesions which might affect the circulation through the eczematous skin. The beneficial effects produced by this treatment may be remarkable. On the other hand, in some cases, this treatment seems to exert no appreciable effect upon the progress of the disease. Such treatment should always be associated with such dietetic and local measures as seem best after examination.

Constitutional treatment is of first importance. The stools should be examined for excess of fats and for indications of excess of sugar or starches. The diet should be studied, also, and in breast-fed infants any relations between the attacks of eczema upon the child and any particular food eaten by the mother. Overfeeding is a common cause of eczema, and this must be carefully avoided. Any lack of the vitamin-containing foods should be noted and these provided in small but steadily increasing amounts until the supply is adequate. If no dietetic impropriety can be found, and the eczema resists other treatment, one article of food after another should be removed from the child's diet for a few days, and the effects watched. The mother of a breast-fed baby should also refuse one food after another, for a few days each, until all foods have been thus tested, or until the offending food has been found. It must be remembered that foods ordinarily wholesome may be the subject of anaphylactic sensitization. If the condition of the child permits, a day's fast may well precede the study of the foods. Or, after a day's fast, one article of food may be fed for a few days, and then other foods added, one at a time, about twice each week, until the offending food has been found, or all foods commonly eaten by the child have been tested.

Constipation must receive proper treatment (see Constipation). Rheumatic or asthmatic symptoms should be treated according to the symptoms.

Local treatment gives speedy relief and promotes recovery. Scratching must be prevented. This is best done by means of a "kiddie cuff" or some similar article. A large mailing tube covered softly is best; this fastened over the elbows in such a way that the child is free to make almost any movement except to reach the eczematous areas. This is easily made, simple, easily replaced if necessary, and causes no pain or discomfort except the inability to scratch. Aluminum mits are on sale; these have a fabric wrist which can be fastened to the clothing of the baby.

Local applications depend upon the type of eczema present. For eczema of the buttocks or groin the diapers must receive great care. They should be washed without soda, well dried, and they must be removed at once when soiled or wet. They should not be used after drying until they have been well washed. For older children, enuresis may require attention. Their clothing must not be too tight

and it is best to avoid all coloring matter in the underclothes. The same precautions as to washing should be taken as for the diapers of babies.

Before any local application is made the affected parts must be cleansed thoroughly and crusts removed if any are found. Water with starch or boric acid, or any soft oil may be employed for this cleansing. Very mild soap is rarely necessary, and so soap should be used if it is possible to secure cleanliness without it. Vaseline and cold cream may facilitate the removal of the exudate and crusts; it may be necessary to apply the cold cream or the vaseline thickly under a dressing and allow the crusts to soften for some hours before further attempts at removal.

Lassar's paste is generally useful:

Zinci oxidi	8 parts
Amyli	8 "
Vaseline	16 " M

For acute eezemas in little babies the following is an excellent preparation:

Oxide of zinc	40 parts
Chalk	40 "
Leadwater	20 "
Linseed oil	20 " M

Mix the first two ingredients together well; then mix the last two together, then add the first to the last, stirring and mixing well. It is important that this process be exactly followed, or the result will not be satisfactory.

Lime water, lead water, solutions of sodium bicarbonate or borax and calamine lotion are often comfortable and tend to prevent further irritation. Calamine lotion has the following formula:

Calamine	1 part
Zinc oxide	4 "
Glycerine	16 "
Aqua calcis	24 "
Aqua rosae	120 " M

For chronic eezema the oil of cade may provide the required stimulation. It is best used as an ointment with the following formula:

ol. cadini	2-4 parts
zinci oxidi	2-4 "
unguenti. aquae rosea	32 " M

Very old, chronic cases with itching, scaly skin require even more stimulating applications. Green soap, stronger preparation of tar, resorcin or ichthyol are indicated. Before the application of ointments, as much of the thickened epidermis should be removed as is possible without injuring the underlying layers of the skin.

Generally speaking, drying applications are indicated for types of eczema with marked exudation, and ointments and fatty applications for dry eczemas. In moist eczemas, when crusts are present, it may be necessary to use oily applications for softening the crusts. But after the crusts are removed, the weeping surface should not be dressed with ointments or with any fatty application.

Applications of any kind should be covered with sterile dressings, anything sterile, porous, and light in weight may be employed; lint, cotton and gauze are most commonly used.

Moist eczemas may be covered thickly with any sterile, non-irritating powder. These are often comfortable and they protect the skin and tend to hasten recovery in suitable cases. Corn-starch, French chalk, lycopodium, bismuth and stearate of zinc are all good in certain cases. The following mixture relieves the itching in most cases :

Camphori	2 parts
Zinc oxide	8 “
Amyli	16 “ M

Equal parts of starch or talcum with boric acid is often soothing. It may be necessary to bathe the parts first in some solution for the relief of the itching; then after this solution has been allowed to evaporate, or has been gently dried with a soft cloth, the powder may be applied. Black wash, a solution of calomel and lime water, is an old remedy for itching. A weak solution of carbolic or of salicylic acid also quiets the itching and the burning.

In eczemas which are not too moist and in those which are quite dry an application of equal parts of olive or almond oil and lime water, or this same solution made into a paste with starch is useful.

An old simple remedy is composed of flour, dried and browned in the oven. This is sterile, absorbent, very soft, and if it is thoroughly browned it does not form a hard crust. A fresh supply should be browned daily, in order that it may be sterile when it is applied.

For eczema which is moderately dry, an ointment may be spread upon cloth and applied. Ointment simply laid on is of little value. Any of the bland, non-irritating ointments may be used. In obstinate cases calomel, tar or resorcin ointments may be used.

For intertrigo, calamine lotion gives relief. Great care is necessary in order to prevent injury to the delicate skin in cases of intertrigo of the diaper area. It is usually better in these cases to lay the diaper or some absorbent material under the baby, and not to apply the diaper in the usual manner at all until the intertrigo has diminished or disappeared. Abundant applications of powder, or a fold of well powdered cotton or gauze may be used to separate the folds of skin.



### Prognosis

During the first year of life eczemas are very obstinate. At about the end of the first year there seems to be a spontaneous tendency to improvement and perhaps to recovery. In many cases recovery marks the beginning of the second year of life, but during this year and at intervals during childhood attacks of eczema recur.

Intertrigo usually disappears promptly with correct treatment. If the babies suffer from gastrointestinal disturbances the intertrigo may be very obstinate, or may recur frequently.

In most cases of ordinary eczema several months of treatment are required for recovery. Milder cases may recover more quickly.

## CHAPTER LXXXI

### INFLAMMATIONS OF THE SKIN DUE TO INTERNAL CONDITIONS

The skin is subject to the effects of poisonous materials within the blood stream, especially of those poisons which may be eliminated by the sweat glands or the sebaceous glands of the skin. The skin is also subject to abnormal circulatory conditions due to nervous disturbances, and to the effects produced by disorders of the nervous system which affect trophic conditions by some mechanism not yet understood. Certain emotional states may affect the skin, and the mechanism of this reaction is not understood. Normally, the circulation through the skin is modified greatly by emotional conditions, and the tension of the non-striated muscles or the hair follicles is also subject to the effects produced by emotional states. Blushing, pallor, the roughness of the skin which may appear in terror or excitement are common examples of this reaction.

The inflammatory diseases of the skin which are due to toxemia are usually subject to nervous influences, and anything which causes abnormal emotions or excitement tends to increase the severity of the skin irritations.

#### URTICARIA

(Hives; Nettlerash)

This is an inflammation of skin, characterized by whitish or reddish elevations, variable as to size, shape and usually very evanescent; they are associated with itching, stinging and prickling.

**Etiology.** This is a very common disease, and it may be caused by a number of different conditions, although they are almost always concerned with digestive disorders.

During childhood, the most common causes are dietetic. Any child may suffer from urticaria if the digestion of proteid foods is disturbed. Some children have an idiosyncrasy for certain foods, and this seems often to be hereditary. Anaphylaxis is certainly concerned in some of these cases; it must be remembered that anaphylactic sensitiveness can be transmitted to the offspring by the mother. Little babies may have such sensitiveness not shared by the mother. In such a case the mother may eat some article of food which she likes and digests easily, without trouble, but to which the baby is sensitive, after which the baby has hives or some similar eruption, or other unpleasant symptoms.

The foods most commonly the subject of this idiosyncrasy are shell-fish, eggs, veal, any pork foods, cheese, and any proteid food which is not quite fresh: and strawberries, raspberries, bananas, and other fruits less commonly concerned.

Intestinal worms may cause hives. The urticarial wheals are then very often located peculiarly. A line around the neck, a band around the waist or symmetrical patches of strange shapes may be composed of small urticarial eruptions or of a few larger wheals.

Drugs and serum injections often cause very severe, even giant, urticaria.

Cutaneous irritation may cause hives; these may be limited to the irritated area, but may involve the entire body. The sting of nettles, jelly-fish, hairy caterpillars, and sometimes the bites of fleas, wood-ticks, jiggers (chiggers) and mosquitoes, and the irritation due to woolen or starchy garments, any of these may initiate an attack of hives in children with an idiosyncrasy to them.

**Pathology.** The typical wheal consists of a small, circumscribed area of edema which involves chiefly the corium, with dilatation of the blood vessels and marked accumulation of leukocytes. The disturbance is vaso-motor.

**Symptoms.** The itching may precede or follow the development of the wheals. These vary in size, and are usually less than an inch in diameter. In giant urticaria the wheals are very large, sometimes involving nearly all of the skin upon a limb, or covering the entire front of the chest. The wheals may disappear within a few minutes, or may last an hour or two; rarely they may persist for a day or more.

The wheals rarely appear upon mucous membranes; if they affect the mouth and larynx the child may die of suffocation.

Scratching of the skin leads to further wheal formation. It is almost impossible for a child to avoid scratching. Successive crops of hives may appear if the toxemia persists.

Several types of urticaria are found. Infants show a pronounced tendency to the development of vesicles, papules and sometimes pustules to appear upon the surface of the wheals. The terms "red gum," "urticaria papulosa," "lichen urticatus," "strophulus," etc., have been applied to this condition. When the primary wheals are not recognized, the diagnosis may be difficult.

Repeated scratching may lead to crust formation; rarely these become pigmented, and to this condition the name "urticaria pigmentosa" has been applied.

Complications include the digestive disturbance, which may or may not be etiological, exudative erythema, purpura, arthritis, asthma, other less common disturbances due to the nervous irritation, the digestive disturbances and the toxemia.

**Treatment.** When it is remembered that the disease is primarily due to toxic conditions, the treatment is evident. It is necessary to hasten the elimination of toxic substance and to remove every cause

of the intake or the retention of substances which are poisonous to the child.

A thorough, general treatment should be given at once. The abdomen should be palpated in the search for retained fecal material. The ribs should be lifted over the liver and spleen, and any abnormal condition found on physical examination should receive attention.

The bowels should receive attention, and whether any accumulations are found or not, whether any history of constipation is found or not, the colon should be washed with an enema of weak soap or soda solution.

If the cause can be found and eliminated recovery follows at once. If no improper food has been given the child, it may be that some of his regular foods have failed of proper digestion, the abnormal products absorbed by an abnormal intestinal tract, and these give the initial and sensitizing dose of abnormal protein. If necessary, the skin tests for the various proteids used in the child's food may be employed, and the offending protein thus recognized and eliminated.

If the irritation has been due to jelly-fish, he must not bathe in water infested by jelly-fish. If it is due to insect bites, he must avoid the dogs or cats that carry the fleas, or must avoid the woods infested by ticks and chiggers.

Local treatment for the itching may be necessary. Lotions are better than ointments. Saturated soda solution dabbed over the hives and allowed to dry is a classic remedy. Camphor water, thymol, weak carbolic acid solution or carbolized vaseline, lead water, ichthyol, and chloroform are used. Chloroform must be scantily brushed over the surface; it must not be used if the skin is broken or for babies. Carbolic acid should not be used for babies, nor for small children. Children of school age may be greatly relieved by these applications.

Powders are sometimes pleasant. Any mixtures of starch, talcum, boric acid, and other non-irritating powder may be used; if they are comfortable they do no harm; if they do not relieve the itching there is no use in continuing them.

**Prognosis.** Little babies with urticaria papulosa have rather a gloomy future. The hives do not kill them, but they are very resistant to treatment and recurrences are very common.

Older children recover from any one attack within a few days, if the cause is removed. There is a tendency to recurrence at any time during childhood, not only when the causative factors recur, but also without apparent cause.



## ANGIONEUROTIC EDEMA

(Acute circumscribed edema; Giant urticaria)

This is similar to urticaria, and may be a different type of that disease. It is a vaso-motor neurosis, and the attacks may follow chilling, indigestion or nervous excitement.

**Etiology.** The condition is hereditary in most cases, but single cases have been reported. No changes in blood or urine can be found. Bony lesions were not recognizable in the few cases examined by osteopathic physicians.

**Symptoms.** Suddenly at any time circumscribed areas of the skin swell, resembling the wheals or urticaria, but without the reddened surrounding area, and without any discomfort or itching. Any area of the body may be affected, at any time. Serious symptoms and death may be due to involvement of the laryngeal mucous membrane. Typical urticarial wheals may appear in other parts of the body at the same time. Purpuric or erythematous eruption may also appear simultaneously with the angioneurotic attacks.

**Treatment** is very unsatisfactory. Any cause of abnormal metabolism or of disturbed digestion should be removed. The diet should include little or no meat, many fresh green vegetables and fresh fruits. In one case on record, the attacks did not appear when the patient spent much time out of doors, but were troublesome (from pressure) when he was indoors much of the time.

**Prognosis.** So long as the swellings do not invade the respiratory or the urinary tract, no harm results. Death may be due to suffocation if the larynx or trachea become invaded.

## HERPES

Herpes is characterized by the eruption of many vesicles, arranged in groups, not spontaneously ruptured, and terminating by the absorption of the liquid and the desquamation of the vesicles. Local pain or constitutional symptoms may or may not be present.

**Herpes Simplex** (Herpes facialis; herpes labialis; cold sore; fever blister; fever sore). This type of herpes appears upon the lip or the face, and is often associated with fever or with cold, hence the names. Lesions of the occiput and cervical vertebrae are present.

There may be a single group of vesicles at the corner of the mouth, and the acts of eating, talking and so on cause fissures to appear; these may become very painful. In other cases two or several groups may appear around the mouth or on the lips. Groups may appear upon the cheeks or the chin (herpes facialis). These are not usually painful. The condition is easily recognized.

**Herpetic fever** has been described. The onset is with a chill, fever follows, and the eruption appears around the mouth in most

cases. Facial herpes, even involving the ears, sometimes occurs. With the eruption, the fever diminishes; the vesicles dry up, leaving thin crusts; these become rubbed off, and the child is normal until another attack, usually several months later.

**Treatment.** Correction of the cervical lesions is of prime importance in hastening recovery. The primary disease must receive attention. The first appearance of a sore should receive local treatment. An application of flexible collodium relieves the irritation, pain and burning, and prevents extension of the disease. The eruption usually disappears within a few days, but the fissures at the corners of the mouth persist for several days longer. A series of such sores sometimes occurs in poorly nourished children.

**Herpes progenitalis** is situated upon the vulva or the glans and prepuce. The eruption resembles that of herpes facialis at first, but the irritation due to the rubbing of the clothing and the flow of urine may cause ulceration. This may resemble soft chancre. This type of herpes is rare in childhood, but may be found during the adolescent years. Lumbar or sacroiliac lesions are present.

**Treatment** includes correction of the inevitable bony lesions, relief of any systemic abnormalities which may be found, and local applications if the burning or itching cause discomfort. Cleanliness is very important; the affected parts should be washed several times each day, then well dried, and powdered or anointed with a lotion or ointment. Boric acid, zinc oxide or zinc sulphate are used, either in ointments or lotions. Calamine lotion is often useful. Borated cotton may be used over the powdered or anointed surface.

### HERPES ZOSTER

This is rather more frequent during childhood, but it is less severe in children than in adults. The eruption follows the course of some one or more sensory nerves. The thorax is most commonly affected, though any nerve of the body may be followed by this eruption.

**Etiology.** The cause is very often a bony lesion affecting the nerve trunk itself. It must be remembered that a vertebral lesion is always associated with edema of the surrounding tissues, and that this edema may exert pressure upon the intervertebral ganglia (sensory) and also upon the sympathetic ganglia of the same region. The lesion is found on examination. Very often the hypersensitiveness of the tissue around the lesioned vertebra, mandible or innominate makes it impossible to secure adequate correction of the lesion during the acute attack of herpes, but gentle efforts toward correction relieves the hypersensitiveness and hastens recovery from the herpes.

In other cases there seems to be some infectious agent present, with interstitial neuritis.

**Symptoms.** The onset is usually gradual with neuralgic pain or dull aching in the tissues innervated by the affected nerve. There may or may not be digestive disturbances, such as vomiting and diarrhea. This preliminary pain is much less frequent and much less severe in children than it is in adults. The pain usually antedates the eruption by a day or two or three, but the pain and the eruption may be synchronous. The appearance of the eruption may terminate the pain and usually terminates any digestive symptoms which may be present, or the pain may persist.

Groups of vesicles appear placed rather irregularly upon the skin innervated by one nerve, rarely two or several nerves. These vesicles may become confluent, forming blebs. The liquid within them becomes absorbed within a day or a few days, leaving a yellowish or brownish crust. These become rubbed away, and the skin is left normal. Very rarely the injury to the skin is more severe; the vesicles are filled with bloody fluid, the deeper layers of the skin, sometimes even the subcutaneous connective tissues are invaded and scars are left which may be very unpleasant.

Rarely also, in children, the neuralgic pain may persist after the skin becomes normal.

Herpes zoster seems to be associated with chicken pox very often, and sometimes one child in a family may suffer from one disease and others suffer from the other. That is, a child may be exposed to chicken pox and then have herpes zoster and no chicken pox, or a child may be exposed to herpes zoster and thus contract chicken pox. Herpes zoster may follow chicken pox in the same child. (See chicken pox).

**Treatment.** Mild cases require no treatment other than the correction of lesions and the maintenance of good diet and good hygiene. In more severe cases the treatment of the fever and the neuralgic pain may be required. General treatment gives relief in many cases.

The eruption rarely requires attention in children. Large blebs may be opened, but usually they are absorbed without trouble. Protection of the injured skin is usually the most important factor in the local treatment. The vesicles should be covered with flexible collodium. Dusting powders of boric acid, zinc oxide, talcum and other mild powders may be generously applied, and this covered with gauze or linen. If the parts become soiled the dressings must be removed, the skin washed, dried gently, and the dressing replaced. In children the pain is rarely so severe as to require bathing with cocaine.

**Prognosis.** The eruption usually disappears within a week or ten days. No ill effects are noted afterward in children. In the more severe hemorrhagic cases, or when successive crops appear, the disease may persist for several weeks; this is rarely found in children.

**ERYTHEMA MULTIFORME**

(Erythema Exudativum)

This is an acute inflammatory disease of the skin, characterized by lesions which vary greatly in different individuals, but not greatly in any one individual, and which tend to be arranged in a circular manner over the skin.

**Etiology.** The cause is not known, but the disease seems to be due to some form of toxemia. It is commoner in autumn and spring; is usually associated with gastrointestinal disorders, and may be associated with rheumatism. Urticaria and purpura may coexist; there seems to be marked similarity in these diseases. In children subject to erythema multiforme, any digestive, emotional or reflex disturbance may initiate an attack, or it may follow the use of any of several drugs or serums.

**Symptoms.** The eruption is at first bright red, then becomes bluish red or purplish. The patches are somewhat elevated, or may consist of vesicles, papules, or bullae. The skin of the dorsal surfaces of the hands, the forearms, legs and neck are most commonly affected. The mucous membranes, especially of the mouth, nose and throat, and the conjunctivae may be affected. Burning and itching of the eruption is not usually severe. Constitutional symptoms vary, and may include rheumatic symptoms, light fever, or gastrointestinal symptoms.

Several types are recognized. These are not distinct, and several forms may be present in one patient at one time.

Erythema papulatum is the most common. The rash is composed of flat papules, red at first, but later becoming purple, and arranged in areas which have a somewhat circular outline. The center of each papule is often depressed. Erythema tuberculatum is somewhat similar, but the papules are larger and more prominent, and the circular tendency is less marked. Erythema iris (herpes iris) is rather striking in appearance. The papules or vesicles are rather distinctly circular, and fresh lesions occur around the earlier ones. The central areas become dark in color and finally fade, while the peripheral circle is always bright red in color. Erythema circinatum is in the form of a circle, the center fades while the periphery extends outward. It differs from erythema iris in having only one circle instead of several concentric circles. Erythema marginatum resembles erythema circinatum, but the outline is composed of irregular, somewhat curving lines and the patch is not circular. Erythema annulare is made up of many rings, not concentric. These rings may spread until they touch and coalesce; the eruption which lies within the confluent rings disappears, and there results the type called erythema gyratum. Rarely the eruption resembles urticaria and persists for some time; this type is called erythema perstans,



or erythema multiforme perstans. When the vesicles make up the chief part of the eruption, the condition is called erythema vesiculolum. Sometimes the exudate is pronounced, and blebs are formed; this type is called erythema bullosum. In many cases several types are found mixed together. There are all intermediate grades between this disease and urticaria.

**Diagnosis.** In typical cases there is no difficulty in diagnosis. The cases in which urticaria coexists, or which resemble urticaria, may give some trouble. Erythema bullosum may be confused with pemphigus, but other lesions are usually present in erythema which make the diagnosis clear.

**Treatment.** Local treatment is rarely required, since the eruption is rarely annoying. If there is any itching or burning, the applications used for urticaria may be employed. Constitutional treatment depends upon the conditions found on examination. General treatment for the relief of such structural conditions as may be found should be given. Usually rigid lower thoracic muscles are found, and these should receive such treatment as the condition of the child warrants.

The bowels should be thoroughly cleansed. The diet should include abundant vitamins. Children should be given fruits and vegetables.

Bullae should be punctured and the contents gently evacuated.

**Prognosis.** American cases usually recover within ten days to two weeks. In Europe very severe attacks, probably infectious, are sometimes fatal.

Recurrences are frequently noted; sometimes these appear at about the same time each year. In other cases successive crops of the eruption prolong the course of the disease for several weeks.

### ERYTHEMA NODOSUM

(Dermatitis contusiformis)

This is rather a rare disease. It affects girls more often than boys, and rarely appears before the age of ten years. The onset is characterized by feverishness, gastric symptoms, malaise, and pains around the joints. The tibial surfaces, arms and forearms, and, rarely, the mouth, are involved. The eruptions consists of nodules which may be as large as a hen's egg, but usually are about as large as a cherry. They seem to begin in the deeper tissues, and as they increase in size they reach the skin. They are hard at first, but when their complete size is attained they become soft and fluctuating; they are then absorbed and leave no trace upon the skin. They are red, then dark, following the color changes of a bruise. The nodules are tender, and sometimes painful throbbing is noted. Sometimes the nodules appear one or a few at a time, in successive crops. Rarely the fever is high, and cardiac, cerebral and other serious symptoms occur. The cerebral symptoms usually diminish with the appearance of the nodules.

**The etiology** is not known. It may be associated with rheumatic symptoms, and it is probably due to some toxemia.

**Diagnosis** is usually easy. If only one or two nodules appear, they may be supposed to be bruises.

**Treatment.** Rest in bed, a diet chiefly of vegetables and fruits, the cleansing of the bowels, and the application of lotions for the relief of the pain are all that is known to be good in treatment. Lead water and laudanum is used for the pain if the skin is not broken. The joints may be wrapped in cotton batting if they are painful.

#### ERYTHEMA INDURATUM

This disease is even more rare than erythema nodosum. Its early symptoms are like that disease, but the nodules break down, the skin is broken and the nodules undergo necrosis. The ulcers may heal, or may persist, as chronic, discharging ulcers, purplish red, and resembling tubercular ulcers. No bacteria have been found. The treatment is that of tubercular ulcers.

## CHAPTER LXXXII

### DISEASES OF THE SEBACEOUS GLANDS

#### MILIUM

Milia are small whitish tumors, usually found beneath the eyes, but occasionally found almost anywhere upon the face. They are composed of desiccated sebum beneath the epithelium. Boys and girls nearing adolescence often show them abundantly. Little babies frequently are affected in the same way.

For little babies no treatment is indicated, save the usual care of the face. If any attempts are made to evacuate them, or to treat them as the same condition is treated later in life, infection is apt to occur and serious sores may result.

For older children vigorous washing with a mild soap is usually all that is necessary. If this is not sufficient, then the tumor may be opened with a sterile needle and the contents gently expressed. They are not apt to recur in the same place, but the condition which produces one milia may cause many others in the same neighborhood. Children so affected should receive the constitutional treatment given for acne.

#### COMEDONES

(Blackheads)

The comedo is a plug of sebaceous material which has accumulated in the opening of a sebaceous follicle. They are most common where the sebaceous glands are most abundant, on the forehead, nose, nasolabial folds, chest, chin and back. They are occasionally arranged in small groups.

The cause is not known, but is probably the same as that of acne.

Vigorous washing with soap, massage with a moderately rough towel and the use of a bland cold cream or some other non-medicated ointment followed by massage usually removes the accumulations. If this is not followed by relief, the material softened by the soap, washing and ointment may be expressed by gentle pressure. The area should then be gently bathed and, if painful, some non-medicated lotion applied. Rubbing the skin gently with a piece of ice occasionally acts as a mild astringent and tends to prevent recurrence.

**Grouped Comedones.** Little babies may show groups of comedones upon areas kept warm and moist and subjected to pressure. The cheek is especially affected. The only treatment for babies is to prevent areas subjected to pressure from being moist. Too great heat must be avoided at all times.

## ACNE

Acne is common among children, increasing irregularly until the puberty age. During the years of adolescence acne is very common, among both boys and girls. The eruption usually increases in extent and in severity in girls at regular intervals, thus indicating the time of menstruation before it has become established. After this the acne is worse just before or during the menstrual period.

### Etiology

The cause is not definitely known. Predisposing causes are many.

Lesions of the fourth cervical to the third thoracic vertebrae are always present. Usually there is a generally irregular condition of the vertebrae through the entire cervical and thoracic region. Lesions of the first rib are fairly common. Many patients with acne show rigidity of the upper lumbar spinal column.

Constipation and other digestive disorders, menstrual disorders among girls in their 'teens, atony of the small muscles of the glands of the skin and the hairs, and dietetic errors are important contributory causes. The excessive use of fatty and carbohydrate foods is the usual dietetic error.

Lack of cleanliness seems to be a factor in some cases. In others an excessive washing of the skin with irritating soaps seems to be a cause of the disease. Dusty air and unhygienic surroundings predisposes to the local condition.

Bacteria have been described for the disease, but none has, as yet, been shown to be responsible for the disease. Abundant bacteria are found in the lesions of the skin, but these seem to be secondary.

The bacillus which has been described for seborrhea has been often found in connection with acne.

### Types

**Acne vulgaris** is characterized by the eruption of "pimples", which consist of an inflammation around the orifices of the sebaceous glands. Acne simplex is the ordinary small swelling around a comedone. It becomes pustular, remains small, and soon disappears.

**Acne indurata** is more severe. The pus accumulates in small amounts in the deeper area of the sebaceous glands. If acne indurata remains untreated until its spontaneous evacuation a small scar usually results.

**Acne papulosa** is characterized by many papules, which may or may not become pustular.

**Acne pustulosa** is composed of lesions which become pustular, and especially those in which pus is abundant. Acne puctata is characterized by small lesions in which comedones are abundant, forming scattered points over the skin. The ordinary acne includes



several or all types of lesion, and the names are properly applied to cases in which one type predominates.

**Acne neonatorum** is the rare presence of acne at birth. It is found on the forehead and in the nasolabial folds. Comedones and pustules are present, as in ordinary acne.

Acne is usually limited to the face, and the lesions do not usually show any tendency to grouping. Acne is not rarely found upon the neck, chest and back. When the lesions are very abundant and purulent, crusting may occur over a considerable area; this is not common.

### Treatment

First in importance is the correction of such lesions as may be found on examination. The most frequent of these have been mentioned.

Constitutional conditions must be carefully sought and corrected. The diet always requires attention; almost invariably the affected child has been given too much carbohydrate food, and has not been well supplied with the vitamin-containing foods. Abundant supplies of green vegetables, fresh fruits, or, if these cannot be secured, dried and canned vegetables may be substituted. If fresh milk, canned tomatoes, dried prunes, and oranges or grapefruit can be secured, these partially supply the needs. The diet should include green vegetables, such as spinach, chard, endive, lettuce, kale, asparagus, artichokes, cucumbers, tomatoes, celery, green onions, and all other leafy foods. Cabbage is an excellent food when eaten raw, but cooked cabbage is absolutely forbidden in patients with acne. Starchy foods must be kept very low. One potato may be eaten in a day, and one slice of bread or one bun or one helping of cereal may be eaten at breakfast, but no starch may be eaten at all at any other meal of the day.

Fats and fried foods are absolutely forbidden. Butter, cream, any gravies or meats which are fat or greasy must be omitted entirely. Fruits may be eaten in abundance, with the exception of bananas. The bananas are excluded because they are starchy.

Abundant drinking of water is indicated. At least four quarts of liquid, water or milk, should be taken daily.

Exercise in the open air is always indicated. It may be necessary to cover the affected areas from the sunshine, but the fresh air and abundant exercise is most useful.

If constipation persists in the face of the diet outlined and the exercise, enemas must be used. These should not be required for many days, if the diet and the exercises are good. A preliminary thorough cleansing of the colon is often necessary, and this may be secured by the use of enemas with such modifications as seem indicated in each case.

Bathing is important from the standpoint of the general health, and especially for the sake of the effects produced upon the skin as a whole. A cool or cold bath on arising should be taken each day. If it is possible, this may be a dip in the surf followed by a thorough rinsing in cool fresh water. The effects of the salt water bathing are excellent, provided the patient does not become fatigued.

A hot bath or a warm bath should be taken at bedtime each day, unless this is found too tiring, in which case the hot or warm bath may be given on alternate days. The hot bath may be followed by a cold or cool shower, and the warm bath must be followed by a shower, spray or rinse of cool water. With each bath a thorough rubbing of the entire skin of the body should be given. The effects produced in this way increase the nutrition of the skin of the face as well as of the areas concerned in the rubbing. Massage is useful in the same way.

The area affected by acne, usually the face, requires especial care. Twice each day the affected area must be thoroughly washed with tar soap or some other mild but active soap. The soap is to be rubbed thoroughly into the skin, and then be washed off with warm water. Several rinsings are necessary to remove the soap completely. The face should then be dried thoroughly. Next some bland ointment or a cold cream should be heavily smeared over the face and massaged gently but thoroughly into the skin. This should then be rubbed off with a soft cloth, carefully avoiding injury. After this the face is very soft and tender. The comedones should be softened by this treatment and the comedones are easily evacuated. The pustules should be opened and the pus removed. Several instruments have been devised for this purpose. Gentle squeezing with the fingertips is satisfactory. A dull eurette may scrape the skin, held tightly, if the lesions are abundant. This irritates the skin, and the face looks very much injured for some hours afterward. This treatment stimulates the skin, and sometimes the after-effects are very satisfactory. Any pleasant cold cream or a lotion may be applied just before going to bed. This remains on the face all night.

If this method is too severe, the skin may be well washed just before bedtime, using any good face soap and scrubbing according to the delicacy of the skin. Then the skin should be steamed, either over a boiling kettle or by means of hot damp cloths, until it is reddened and softened. If pustules or comedones of any considerable size remain they may be gently evacuated. Some soothing ointment or cream should then be applied and this left over night. The ointment should be removed in tepid water the next day. This vigorous cleansing may be repeated each night until no more comedones appear. If the skin becomes irritated or scaly, only the ointment should be applied at night.

Ointments containing sulphur, salicylic acid or green soap may be used in obstinate cases. X-ray treatments may give relief in pro-

longed and refractory cases. A very skillful radiologist must be consulted. Protecting the skin from sunshine or even daylight may aid, especially in those cases with severe inflammation.

**Prognosis.** Almost every case recovers spontaneously when the puberty changes are completed. A few persist into adult life. No harmful after-effects are noted, other than the disfiguration and the scarring. With correct treatment nearly every case clears up within a week or a few weeks. Occasionally acne persists in spite of the most sensible and persistent treatment.

Disfiguring scars follow every severe case of acne, and these may persist during a lifetime.

## SEBORRHEA

(Seborrheic Eczema; Seborrhea Corporis; Seborrhea Capitis; Pityriasis Capitis; Eczema Seborrheicum; Dermatitis Seborrhoicum; Seborrhea sicca.)

Seborrhea is a mild dermatitis, usually beginning on the scalp, and characterized by the presence of greasy scales arranged in irregular shapes.

**Etiology.** Many authors describe infectious bacteria which cause an inflammation of the sebaceous glands or of the sweat glands. Several different bacteria have been mentioned. A few authors consider the disease due to constitutional abnormalities. It is not denied that constitutional abnormalities are at least important factors in etiology.

The parasitic bacteria are feebly pathogenic and the disease is feebly contagious.

The disease begins as an increase in the amount of sebum; this, with desquamated epithelium and dirt particles, forms a greasy crust at first over one and then other areas of the scalp. This crust is easily softened, and when it is removed, in early cases, the skin is apparently perfectly normal. The crusts soon recur after removal. With the progress of the disease the skin undergoes inflammation, due partly, no doubt, to the retained moisture, partly to the irritation of the crusts with their disintegrating fatty substance, and perhaps partly to the infectious agent itself. Eczematous changes are then found, and the disease is referred to as eczematous seborrhea, or seborrheic eczema. This type of inflammation may affect the skin of the face, especially postauricular region and the nasolabial folds. The skin over the sternum and that between the scapulae are often affected.

**Seborrhea oleosa** is characterized by marked oiliness of affected area and of the hair. It is mostly found in children approaching puberty.

**Seborrhea sicca** is the dryer form, such as is found in little babies. The scales are greasy, but the hair is usually even more dry than normal.

**Seborrheic eczema** of the scalp does not cause marked itching, does not develop into pustules, or vesicles, there is no infiltration, no severe inflammation and no tendency to the development of other types of inflammation.

Seborrhea of the scalp is not uncommon among little babies. The greasy crusts attain considerable thickness, especially in neglected cases. Desquamated epithelium fills the hair with greasy scales. When the crusts are removed, the scalp presents a perfectly normal appearance, in early cases, but the crust reforms with celerity. The use of fine combs, applied with vigor, for the removal of the crusts and the long-continued presence of the fatty deposit, may so irritate the scalp as to cause eczematous inflammation.

**Treatment.** The crusts should be softened by soaking in olive or some other bland oil, and the crusts then washed away with bland soap. An ointment containing sulphur, resorcin or salicylic acid should then be applied.



## CHAPTER LXXXIII

### THE PARASITIC SKIN DISEASES

The skin may be invaded by animal and vegetable parasites. In this connection the bacterial diseases are not included. The diseases due to parasites are transmissible.

#### FUNGUS DISEASES OF THE SKIN

About a hundred varieties of fungus growths cause skin diseases. Nearly all of these affect children more frequently and more severely than adults, and of those which have a predilection for children, nearly all disappear at puberty. A few affect adults chiefly, and a few affect children and persist through puberty. For the most part these fungi grow upon the epithelial cells and the appendages, but do not invade the deeper tissues and do not cause constitutional symptoms. A few tropical fungi present exceptions to this rule; for their description books upon tropical diseases should be consulted. Several of the fungus diseases are common in childhood in this country.

#### RINGWORM

(*Tinea Trichophytina*; Trichophytosis; *Tinea circinata*;  
Microsporiasis)

Ringworm is a contagious disease characterized by vesicles or vesicopapules and an annular or serpiginous method of spreading, due to the growth of a fungus upon the epithelium and the appendages of the skin.

**Etiology.** Many varieties of fungus causing ringworm have been described. Two chief groups are found, the trichophytons, or large-spored fungi, and the microsporons, or small spored fungi. Each of these groups includes many varieties, which vary in their origin, cultural characteristics, predilections for certain areas of the body, and their manner of affecting the hairs.

The disease is often contracted from cats, occasionally from dogs and other pets. Horses, cattle, birds and the hedge-hog have been known to carry the disease to children. The human types are not found upon the lower animals, but are carried from one child to another. The ringworm which a child contracts from an animal is not so easily transmitted from him to another child as is the definitely human fungus, though in some cases several children have been affected from one with an animal type of ringworm.

#### Types of Ringworm

***Tinea circinata*** (ringworm of the body; trichophytosis corporis; *tinea trichophytina corporis*) is a common disease of childhood. It

may be transmitted to the child from another child, or from some animal. Cats, dogs, rabbits, cattle, horses, canaries and wild animals tamed for pets are responsible in about the order named. Poorly nourished children are more frequently and more severely affected.

The disease begins in the hands, arms, face or neck, or upon some other smooth skin, as a pinkish papule. This increases in size, and many other small vesicles or papules become developed around the periphery. The central area clears up, leaving almost normal, slightly roughened skin. The ring thus formed increases in size, often to an inch or two inches in diameter. Occasionally several rings become confluent, in which case the contiguous walls disappear and the line of inflammation becomes serpiginous. Rarely a second ring is formed within the first, and thus concentric rings, two or even three, may be found. Several other rings usually follow the first, probably by autoinfection, but these also soon disappear. The succession of rings may persist for several weeks. No constitutional symptoms or evil after-effects are to be expected.

The diagnosis is usually made at a glance. In atypical cases scrapings from the affected skin should be treated with a solution of potassium hydrate, about 25% in water for about one minute, then examined microscopically. The characteristic mould-like organisms are usually abundant. If they are not thus easily visible, cultures may be made.

**Tinea tonsurans** (*Tinea trichophyton capitis*; *tinea capitis*; ring-worm of the scalp) is definitely a disease of childhood; it does not persist beyond puberty. The first appearance is a small scaly patch or a small papule surrounding a hair. The base is slightly reddish or red, and there are whitish or grayish scales. The patch increases in a circular manner, but the central area does not heal, as in ring-worm of the body. Disseminated infected hairs may be found scattered over the head, either at the onset or after treatment and partial recovery. Occasionally staphylococcus infection follows, and pustules become developed. The hair of the affected area becomes dry, brittle, dull and broken, and finally disappears almost or quite completely. Sometimes the hairs break off at the skin, leaving black dots. Several areas may be affected at the same time, or in succession, or a single area may spread or remain quiescent.

The disease usually persists for several months, with the best of care. Without treatment, the hair is permanently made brittle and rough. The disease disappears at puberty.

**Tinea cruris** (*tinea trichophytina cruris*; *eczema marginatum*; *dhobie itch*) is not often found in temperate zones. It is found in the axillary and the genitocrural regions. The heat and moisture lead to marked inflammation, and the itching to severe scratching. This, in turn, permits infection, with the development of pustules;

boils or abscesses. It is a very obstinate disease, but recovery is to be expected in time, with correct treatment.

**Onychomycosis** (ringworm of the nails; *trichophytina unguium*; *tinea trichophytina unguium*; *onychomycosis trichophytina*; *favus onychia*; *favus of the nails*; *tinea favosa unguium*; *onychomycosis favosa*) may exist alone, or, more frequently, be associated with ringworm elsewhere in the body. One or two nails are usually affected, rarely several nails may suffer from the disease. Either ringworm or *favus* may be the infectious agent.

The onset is insidious. At the corner the nail becomes brittle and yellowish or grayish in color, and it may become friable. This condition may persist unchanged for months or even years. Usually the disease spreads beneath the nail very slowly, but the entire nail is rarely involved. Beneath the affected nail there is a yellowish or grayish accumulation of cells, debris and fungus. The nail may be somewhat elevated by this accumulation. The affected nails may become very thick, deformed and horny.

### Diagnosis of Ringworm

The character of the lesions usually gives the diagnosis at a glance. Microscopic examination of scrapings from the affected areas definitely determines the diagnosis in all ordinary cases. The scrapings should be treated with a solution of sodium or potassium hydrate, 20 to 25%, for a few minutes to an hour or two, until the tissue has been dissolved at least partially. The microscopic examination of this preparation usually shows very abundant spores and mould-like mycelia. In these cases with secondary pyogenic infection it may be very difficult to find the fungus; in such cases cultures may be made which show the fungus and these usually determine also the variety.

### Treatment of Ringworm

The affected parts should first be thoroughly washed in soap and warm water. All desquamating epithelium must be removed.

When the soles, palms and nails are affected, this washing must be soaked in warm soapy water until they are thoroughly softened, then the affected parts should be scraped.

Ringworm of the scalp in children does not require depilation if the treatment is persistently given, though permanent recovery is more speedily and certainly secured if the affected areas have the hairs removed. X-ray depilation is best commended. About three weeks after the X-ray treatment the hair falls out. The scalp then receives thorough treatment for ringworm, and the hair permitted to grow again, as it does within two or three months. If small areas are affected the hairs can be pulled out with tweezers.

For the hair, after thorough cleansing of the scalp, the following ointment should be thoroughly rubbed in, and allowed to remain.

The resulting stain can be removed from the skin by lemon juice or diluted oxalic acid.

Iodine crystals	1 part
Goose-grease	32 "
Mix by rubbing together very thoroughly.	

This ointment can be used anywhere on the body. It is especially useful in treating ringworm of the nails in children.

For the body tincture of iodine should be painted over the affected area each day for four days, or the iodine ointment given for the head may be used. The resulting stain may be removed with lemon juice or a weak solution of oxalic acid.

Other parasiticides are ammoniated mercury ointment and salicylic acid ointment.

Hydrag. Ammon.	2 parts
Ungt. Simplicis	32 " M
Salicylic ac.	2 parts
Ungt. simplicis	32 " M

**Prognosis.** Ringworm disappears from the body within a few weeks, in ordinary cases. Ringworm of the scalp persists for several months, under ordinary circumstances, and may not disappear before puberty if proper care is not given. The hair may be permanently injured, and bald areas be present throughout life. Ringworm of the nails is extremely persistent, usually, though occasionally it disappears within a few weeks after thorough treatment.

Nearly all cases acquired during childhood disappear during the puberty changes.

## SKIN DISEASES DUE TO ANIMAL PARASITES

In all diseases of the skin due to animal parasites secondary lesions are abundant. These include papules, vesicles, blebs, pustules and excoriations. Impetiginous lesions are often present. The irritated skin may resemble eczematous skin. Itching is very severe in all parasitic diseases which are found in this country among children.

### SCABIES

(Itch)

This is an infection of the skin by a very small arachnid, the *acarus scabei* (*sarcoptes scabei*; *sarcoptes humanis*). This is carried by human beings only. It is transferred with clothing or bedding, or by direct contact with infested individuals.

The female *acarus* burrows along the skin depositing her eggs and excrement in the channel thus made. The eggs hatch within five or six days. About two weeks after hatching the *acarus* is fully developed, the females lay eggs, and thus the condition is per-



petuated. The female dies at the end of the burrow. The male seems to be comparatively harmless. The burrows are pathognomonic. They are most abundant upon thin areas of skin, the inner sides of the fingers, flexor surfaces of the wrists and elbows, and the nipples. Almost any area, except the face and head, and the skin of the penis may be slightly invaded. Each burrow is a thin line, from one-eighth to one-half inch long. One end is somewhat elevated and shows a whitish spot; this is the female.

The itching is very severe, especially at night. The warmth of the bed seems to encourage the forthcoming of the young insects. The irritation due to the presence of the acari and that due to the irresistible itching, produce papules, vesicles, and bleeding, sometimes crusted linear lesions. Infection with pyogenic bacteria is almost inevitable, and pustules are almost inevitable. Eczematous areas are found in cases of long standing.

The diagnosis rests upon the presence of burrows, the characteristic distribution of irritative skin lesions, and a history of exposure. Eosinophilia has been described; in any irritative skin lesion eosinophilia may be expected.

**Treatment** depends upon killing the acari and the eggs, and avoiding future infection. In order to expose the insects to the action of a parasiticide the skin must be softened thoroughly. A bath of hot water and strong soapsuds, with vigorous rubbing, supplies this need. The skin should not be injured by the soap or the rubbing. A nail brush and green soap should be used for scrubbing, if the skin can endure it without injury.

After the scrubbing, which should be done at night if this is convenient, the entire skin, except the face and head, should be thickly anointed with some parasiticide. This should be covered with clean clothing and the child placed into a clean bed. The discarded clothing and bedding must be disinfected before using if it is not practicable to burn them. Several parasiticides are useful; their value depends upon the presence of sulphur, beta-naphthol, balsam of Peru or tar, usually prepared with vaseline, green soap or oil.

Wilkinson's ointment is destructive to the parasite but it does not injure the human skin to so great an extent as some other parasitidal ointments. The formula is

Sulph. sublimat.	16 parts
ol. cadini	16 "
cretae praeparat.	10 "
sapo viridis	32 "
adipis	32 "

After the bath with soap and hot water, this preparation is vigorously rubbed into the skin, with particular attention to the areas

known to be affected. The entire body should be covered, and the rubbing should also cover the entire body. At least half an hour should be devoted to the application of the ointment. The patient is then given a hot bath with plenty of soap (green soap if this can be endured without injury), rinses well in clear hot water, then has a cool rinse, puts on clean clothes, has his bed linen changed and the old clothing and old bed linen sterilized. The parasites should be all killed at the end of the treatment. If there is any further infection, the treatment can be repeated.

Sulphur ointment is composed of one part precipitated sulphur to eight parts of vaseline or oil.

Beta-naphthol ointment is composed of one part beta-naphthol to eight parts oil, vaseline, fresh lard or goose-grease. Balsam of Peru may be used alone, or combined with the sulphur ointment, usually one part balsam to 8 parts sulphur ointment.

In every case other members of the family and the playmates of the child should be examined to find the source of contagion, if possible. Re-infection occurs frequently, if the child associates with infested persons.

The persistence of the itching is not to be considered evidence of the continued life of the parasite. The parasiticide ointments tend to cause skin irritation and often eczema follows their too frequent use.

All parasiticides are irritating to the skin, in some degree. With careful planning of the type fitted for each child, the skin should not be greatly irritated. The effects of the scratching also injure the skin. After the parasites have been killed, the application of soft powders, lotions or ointments, such as used for eczema, is indicated. With destruction of the parasites, the eczematous symptoms usually disappear very promptly.

## PEDICULOSIS

(Phthiriasis; Morbus pedicularis; Morbus pediculosis; Mailis pediculi; Lousiness)

Pediculi, or lice, are insects, hemiptera, family pediculidae. Three types are found upon the human being at any time of life. They are easily visible.

Pediculosis pubis is less common among children. The pediculus pubis is a small louse, about half the length of the body louse. It lives in the pubic hair, and rarely migrates or lives elsewhere.

Pediculosis corporis is not uncommon among children who live in uncleanly places and who associate with lousy adults. The pediculus corporis is the largest of human lice.

Pediculosis capitis is more common among children than among adults. The pediculus capitis is nearly as long as the pediculus corporis, but is more slender.

Pediculosis of any type causes severe itching, and the irritation due to scratching, together with the effects of the bites of the insects, causes severe skin lesions. The location of bite may show a wheal, in the center of which a minute flat hemorrhagic area may be seen; the place where the sucking apparatus of the insect was inserted. Vesicles, papules, pustules, eczematous eruptions, impetiginous lesions may be caused by the bites and irritation, the scratching and the inflammation resulting from these factors. Afterwards, pigmented scars and atrophic areas may be found.

The females lay from fifteen to fifty eggs, which they deposit upon hairs of the head or body, or upon the clothing. The ova hatch in about five days, and attain full growth in less than two weeks; their increase may be easily understood.

**Diagnosis** is usually easy. The lice may be found moving upon the skin, the hair, or the clothing, and the ova, or "nits," may be found upon the hairs of the scalp or the fine hairs of the body, or on the clothing. The ova are barely visible to the naked eye, are oval with one slightly pointed end directed outward as they are attached to the hairs. Attention may not be called to the possibility of pediculosis, and the condition be considered merely an old, chronic eczema, urticaria or seborrhea.

**Treatment** includes destruction of the live lice and the ova, and prevention of further infection.

*Pediculi corporis* live upon the clothing and feed upon the skin. The clothing and bedding must be sterilized by heat. In the army delousing was secured, when possible, by leaving the clothing in steam under pressure for about half an hour. This sterilizes also the excreta, so that typhus was also prevented. The few ova which are found upon the fine hairs of the body must also be killed. This is best done by a hot scrubbing, with soap, the soap then lathered freely and left to dry upon the body; or by the use of sulphur, carbolic acid mercurial ointments. Children must have milder ointments than are used for adults. After the parasites have been killed, the treatment for eczema may be required for the relief of the excoriations and the effects of the parasiticides.

*Pediculi capitis* is more common among children than it is among adults, though grown women with unclean, long hair do often harbor them. In some cases only slight itching is due to the presence of the parasites; in other cases the itching is very severe, and vesicles, papules, pustules and crusts may follow the scratching and the subsequent infection with pyogenic bacteria.

Treatment includes the use of parasiticides which do not injure the scalp or the hair. Kerosene is an old standby. The hair should be soaked in a mixture of equal parts of kerosene and sweet oil (not in a room where there is fire or gas lights) and then wrapped in cloth so that the neck and face are protected from the kerosene.

The kerosene mixture should remain for some hours or over night, and then the hair must be thoroughly washed with several hot soapy waters and rinsed in several hot clear waters.

Sulphur, mercuric chloride, beta naphthol, and tincture of *cocculus indicus* are also used, in strengths varying according to the age of the child and the sensitiveness of the skin. Close cutting of the hair renders the treatment much more efficacious, but this is not necessary in ordinary cases, especially if the parents of the child object.

*Pediculus pubis* or crab louse rarely affects children, and in them it has a predilection for the eyebrows. In *pediculosis palpebrarum* the lice and ova may be removed from the hairs by small forceps and the eyebrows anointed with vaseline or a weak citrin ointment, very carefully applied to the edges of the lids.

### ANIMAL AND VEGETABLE PEDICULI

*Pediculoides ventricosus* (Grain-mite dermatitis; acarodermatitis; dermatitis urticarioides; straw, cotton, cotton-seed or grain-mite dermatitis; prairie, swamp, straw, grain, barley, mattress or straw-packer's itch; Texas mange; lumberman's itch; Ohio scratches). *Pediculoides ventricosus* infests straw, grain and sometimes other plants. Children playing in infected straw, sleeping upon mattresses made of infected straw or other materials, and children anywhere who come in contact with infected plants may suffer from the eruption. The onset is with itching and the appearance of spots resembling hives. At about the center of each spot a vesicle or vesicopapule appears; they are very small. The contents of the vesicle become milky and sometimes pustular. By scratching, the top of this vesicle is usually eroded, leaving a slightly hemorrhagic dot; a small scale or crust appears, this rubbed away and recovery is complete in about two weeks from the first infection in mild cases. If the child continues to be exposed to the infection, very severe skin lesions may be formed. These may resemble lichen urticatus, scabies, varicella, erythema, urticaria, and any one of several types of eczema.

**Diagnosis** rests upon the sudden onset, often in several persons at once, the character of the initial lesions, the history of contact with straw or plants and the finding of the mites upon these.

**Treatment** includes, first, the removal of the source of the mites. Carbolyzed Lassar's paste, or carbolyzed calamine lotion, or the treatment employed for urticaria or for eczema is indicated. Recovery is usually prompt when the mites are eliminated.

*Dermanyssus avium et gallinae* (bird mite, fowl mite; chicken louse; chicken mite) is a small parasite which provides one of the problems of those who raise chickens, birds or fowls. Children are rather susceptible to dermatitis due to the presence of these mites



upon the skin. The mites attack the hands and forearms most commonly, but may creep into the axilla or the folds of the skin anywhere. They set up an erythema or sometimes a papular eruption which is associated with severe itching. The scratching may add to the severity of the lesions.

Treatment includes the ordinary materials for the relief of the itching and the removal of the mites, usually by a hot, soapy bath.

Larger insects which attack children, causing varying degrees of dermatitis, include bed-bugs (*cimex lectarius*; *acanthia lectularia*), fleas (*pulex irritans*), mosquitoes (*Culex* *anxifer* and others), black fly (*Simulium*) and other flies, several kinds of bees, hornets, wasps, spiders, ants, caterpillars, wood-ticks (*Ixodes*), harvest bugs (*Leptus autumnalis*, *Americanus* or *irritans*), sand fleas (*pulex penetrans*; *rhinocoprion*; jigger; chigger; chigoe), and many others which are found chiefly in the tropics.

Brown-tail moth (*Euproctis erysorrhea*) is destructive to fruit trees and roses. Its caterpillar especially, and also the cocoon and the adult moth are covered with netting hairs. The touch of these hairs causes an obstinate dermatitis. Articles of clothing or plants touched by the caterpillar may contain enough hairs to initiate the dermatitis on contact. Itching may begin at once at contact, or may be somewhat delayed. Erythematous macules, urticarial wheals with irregular areas of induration follow. The eruption may be eczematoid and fissures may be very painful. Itching is troublesome throughout the course of the dermatitis, which may be a few days or several weeks, according to the severity of the irritation and the sensitiveness of the skin.

Treatment is that of pruritis or eczema or urticaria, according to the character of the lesions.

## CHAPTER LXXXIV

### THE INFECTIOUS DISEASES OF THE SKIN

The infectious diseases of the skin are much less common and less severe than might be expected from the exposed location of the skin and its frequent injury. Several chronic and acute infectious diseases have skin lesions as their most prominent symptom, but in this chapter only the diseases primarily located in the skin are considered.

Immunity is lowered to skin infections, as to other infections, by lesions of the lower thoracic vertebrae. Local immunity is lowered by any condition which interferes with the circulation of the blood or with the nervous control of any area of the skin. The sensory nerves seem to be especially important.

#### IMPETIGO CONTAGIOSA

This is an acute inflammatory infectious disease of the skin, characterized generally by the formation of blebs which become purulent and form peculiar yellowish crusts with loosened edges, or other variable lesions under different circumstances.

**Etiology.** Various views are noted as to the nature of the infectious agent. *Staphylococcus aureus*, streptococcus and *staphylococcus albus* may be present singly or in various combinations, and it is not yet known whether each of these may cause impetigo in individuals predisposed to this type of inflammation, or whether these agents are secondary infections, the disease itself being due to some other, as yet unrecognized, parasite.

Children who live in unclean or poorly ventilated houses, and whose nutrition is impaired are especially subject to the infection. It may affect all or nearly all of the children in the home, the school, or the hospital ward. It is autoinoculable, and is transferred from one part of the body to another by scratching or handling. It has been reported in children not exposed to impetigo infection, but who have been infected by the nasal discharge in coryza (Dunn).

**Symptoms.** Vesicles are the first symptom noted. They are never turbid, but seem loose and sometimes wrinkled. The center may be depressed; distinct umbilication may sometimes be seen. They may be half an inch across, or may be much smaller. The serous content of the vesicles becomes seropurulent and purulent; the thin surface of the vesicle ruptures, and the seropurulent or purulent contents dry into crusts. These crusts are loose at the edges, and this gives the crusts a peculiar "stuck on" appearance. When the crusts are loosened a red inflamed surface appears. This heals very slowly and recovery is complete, so far as the local lesion is concerned.

Cachectic children may suffer more severely. The true skin may be invaded and deep ulcers thus are formed. By extension and auto-

inoculation the condition may be prolonged until great exhaustion is caused. Intercurrent diseases of even mild type may be fatal in these children.

Occasionally the first noted vesicles are filled with pus, and sometimes large bullae, perhaps two inches across, may first form; these are rather loosely filled with serum and become purulent rather speedily.

The eruption is most commonly found upon the face; the limbs, neck and scalp may be invaded, but is not often found upon the trunk.

Only a few vesicles may be present, or they may be abundant. They may coalesce and form large purulent bullae.

The blood shows mild leukocytosis.

Constitution symptoms are not noted in typical cases. Itching, burning and other discomfort are slight or absent. After a few weeks, if the infection persists, secondary anemia follows, often with leucopenia.

Diagnosis is easy in typical cases. The symptoms as noted are not found in any other diseases. The large bullae may suggest pemphigus, but this is a very rare disease, is not contagious, and is usually associated with some constitutional symptoms.

**Treatment.** The crusts should be softened and gently removed, and the inflamed skin washed in an aseptic or mildly antiseptic solution. A dressing of ammoniated mercury ointment or an iodine ointment should be applied. Large bullae should be opened and drained, washed in boric acid solution, and then dressed with a boric acid ointment.

The child must be kept from scratching the lesions or other skin areas. Methods employed in eczema are useful. Bathing is preferably by a shower or spray, if this is possible. The clothing should be changed frequently, and the garments removed be sterilized by boiling.

Transmission of the infection to other children is best avoided by keeping the affected areas well dressed, and by keeping the child away from his playmates. No child with impetigo contagiosa should be allowed to attend school, or to go to any place where other children are gathered.

### INFANTILE IMPETIGO CONTAGIOSA

This form presents certain variations. The skin lesions first appear as blisters, either one alone or several. The face is more often affected, but the limbs or the trunk may be involved. Occasionally the entire body is covered with the lesions. The contents of the blister become purulent very speedily, but the formation of crusts does not usually appear.

This type is extremely contagious, and when one baby in a hospital contracts the disease every other baby is almost invariably affected.

Treatment is usually very successful. The blisters must be opened with a sterile needle and gently drained. The material must be taken up with bits of sterile cotton, and each bit must be discarded at once after using. The affected area may then be bathed gently with sterile water. An ointment must then be applied and this covered with a small bit of gauze or cotton, and this by bandages. The affected areas must be covered with bandages alone, and not by any clothing. When the trunk is involved, the entire body must be clothed in bandages, and no clothing worn at all.

The ointments are made by the following formulae:

Hydrag. Ammon.	2 parts
ungnt. simplicis	32 " M
Salicylic ae.	2 parts
ungt. simplicis	32 " M

The cotton and gauze used in cleaning or dressing the baby must be wrapped immediately in many layers of papers, and burned as soon as possible. Every article used by the baby or which comes in contact with him in any way must be sterilized before it is used by him or by anybody else. Flannels should be used only when necessary, and when the flannel garment is removed it should be washed very thoroughly, then sunned for four hours or more before it is worn again. Cotton garments should be used whenever possible, and these should be washed, then boiled for at least half an hour or sterilized by steam. It must be remembered that the baby is subject to re-infection, and that the disease confers no immunity at all.

### DERMATITIS EXFOLIATIVA

(Ritter's Disease; *Dermatitis exfoliativa infantum* or *neonatorum*;  
*Keratolysis neonatorum*)

This disease is rare. It is probably a form of *impetigo contagiosa*. It is contagious, and with modern hygienic conditions it is very rarely found.

After the first week and before the fifth week, the skin becomes red, usually around the mouth, rarely over the entire body. This redness and some swelling extend over the body until it is practically all involved. As the inflammation extends, the areas first involved begin to desquamate. Usually there is no exudation, and the dry skin rises and then peels off at the slightest irritation. The remaining rete or corium is red and moist; it soon shows new skin, and this is rather rough and hypersensitive.



No constitutional symptoms precede or accompany the disease. The general health of the child is not affected; it may even gain in weight.

**Treatment.** The nutrition of the child must receive careful attention. The surface of the body should be anointed with any bland oils. Ichthyol or boric acid may be mixed with the oil or fat. The surface should be covered with cotton after the application. The corners of the mouth may require attention, lest the resulting fissures prevent nursing. Almond oil or olive oil may be used to soften the crusts, and these should then be carefully washed away with oil or soft water.

**Prognosis.** About half the children die during the desquamation from septicemia, marasmus or exhaustion and loss of heat. The children who live through the attack are not apparently injured by it.

## FURUNCULOSIS

(Skin Abscesses; Boils; Cutaneous Abscesses)

Furuncles, or boils, consist of circumscribed purulent inflammation of the skin or the subcutaneous connective tissue. One boil or a few may exist alone, or there may be abundant boils; when this is the case the term furunculosis is properly applied.

**Etiology.** There is always an infectious agent, such as the pyogenic bacteria and especially the staphylococcus aureus. This bacterium is abundantly present upon the skin and elsewhere, so the presence of the infectious agent is not the sole cause of furuncles.

Some local or constitutional loss of resistance is always present. Lower thoracic lesions lower the resistance to infection. Local conditions include trauma, solution of the continuity of the skin such as is present in eczema or as the result of minute trauma, or injury due to pressure. The delicate skin of an infant predisposes. Constitutional causes include malnutrition especially, and anything which lowers the vitality of the infant or the child. Overeating and improperly balanced diet seem of less importance, except as these may interfere with the general nutrition of the child. Too warm clothing softens the skin and lowers its resistance to infection.

**Tissue changes.** Cutaneous abscesses are found in delicate, premature or marasmic babies. The subcutaneous tissue is not affected, but within the cuticle itself abundant small purulent foci are found.

Skin abscesses may be either single or multiple. They affect the subcutaneous tissues as well as the cuticle itself, or the cuticle may remain normal except for the area occupied by the pointing pus.

Larger furuncles are usually single or few in number.

High blood sugar is a common cause of persistent furunculosis, especially in children of six years old or more.

In boils the infection initiates inflammatory processes first at a hair follicle, or within a sweat gland. Ordinary abscesses are caused when the infectious agent gains entrance to the subcutaneous tissues, and the inflammation originates there.

The cutaneous abscesses of frail infants affect the superficial layers of the skin only.

**Diagnosis.** Boils are so common that there is rarely any difficulty in diagnosis. A painful swelling is the first symptom usually noticed. The skin over the inflamed area is red, and the pain increases until the boil reaches its most marked development. Leukocytes accumulate and die, and the autolytic and cellular enzymes digest the blood and tissue cells, and a liquid or semi-liquid pus is formed, which reaches, elevates and digests the skin overlying the center of the inflamed area. This skin bursts, the pus is pushed upward and outward, evacuating the boil more or less completely. Granulation tissue fills the opening, and recovery is usually rapid after the pus has been evacuated.

In the cutaneous abscesses of frail infants the inflammatory areas are very small and very abundant. The pus accumulates in very small masses, and these are evacuated with ease.

**Treatment.** Local treatment includes the evacuation of the boils and bathing with an antiseptic or aseptic solution. The neighboring skin may be protected against infection by means of any rather stiff ointment. After the boil has been evacuated, the skin should be protected until healing is complete.

If furuncles persist, the blood sugar should be determined. Excess of blood sugar, which may or may not be an early diabetic condition, should receive adequate attention.

Constitutional factors must receive careful study. Lesions of the lower thoracic spinal column are known to lower immunity, and a very important factor in the treatment of children subject to boils is the treatment of the spinal column throughout this area. Lesions are usually present, either bony, ligamentous or muscular, and these must be corrected. Even if it is not possible to recognize definite lesions in this area, the treatment should include raising the ribs and such manipulations as secure increased flexibility of the lower thoracic spinal column.

The diet should be investigated. Many of these children eat too great a proportion of carbohydrate foods, and especially too much candy. Unless the carbohydrate tolerance is very high the blood sugar is always or usually too high.

Since the immunity of little babies is low at best, and since this immunity is diminished by any cause of malnutrition, great care is necessary to avoid infection. The weaker and younger the baby, the more carefully all articles must be rendered aseptic before they are allowed in the vicinity of the baby.

In other words, the constitutional treatment of furunculosis includes the recognition, and if possible, the correction of every abnormal condition that can be found within the body, and the elimination of every unhygienic factor that can be found which affects the baby or the child adversely.

**Prognosis.** Generally the health is not seriously affected, and recovery occurs within a comparatively short time. Babies with cutaneous abscesses and other children with many boils may become greatly exhausted and may even die from exhaustion or toxemia or from some intercurrent disease.

### GRANULOMA PYOGENICUM

(Granuloma pediculum or pediculatum; Granuloma telangiectodes; Pseudobotryomycosis; Botryomycosis humaine)

Granulation tissue may develop to such an extent after staphylococcus infection of the skin as to form a tumor as large as a pea or a cherry. It is pedunculated, and the peduncle may be very short or long and slender. The tumor is composed of granulation tissue, in the meshes of which are found groups of staphylococci. Small blood vessels may or may not be present, or there may be blood channels of considerable size, compared with the size of the tumor.

These granuloma may be found upon any exposed surface, but are more common upon the hands, the feet, and the lips. They are not usually painful, their chief discomfort is due to the annoyance, and their tendency to be injured. If they are removed by cutting the pedicle they recur promptly.

They should be removed by electricity, or they may be cut off and the pedicle thoroughly cauterized.

### DERMATITIS GANGRENOSA

(Infantile gangrenous ecthyma; Multiple cachectic gangrene)

This rare disease may be either primary or secondary. It is characterized by the presence of pustules which produce ulcers, these becoming gangrenous and leading to death or to recovery with many deep scars.

Puny babies and very badly nourished children are those affected. Causes of the primary form include only very poor nutrition, with the invasion of some of the pyogenic bacteria, of which the streptococcus pyogenes is most commonly present. In the primary form a few or many pustules appear, usually upon the buttocks. These form a crust which is adherent to the subjacent tissue. Beneath the crust or after the removal of the crust an ulcer is found, often hemorrhagic, with sharp but not undermined edges. The gangrenous processes go on in the floor of the ulcer. When the crust is removed a small mass of blackened, necrotic tissue adheres to it.

The secondary form appears only in puny babies and children, and it may follow any of the diseases of the skin in which purulent foci appear. Variella (chicken-pox) is the most common primary cause. When the pustules seem about to dry up and recovery seems imminent, the crusts instead persist. On removal a mass of necrotic tissue is adherent, and a deep, sharply marked ulcer, with gangrenous and sometimes hemorrhagic floor is found.

Constitutional symptoms vary with severity of the attack. Mild cases show no constitutional symptoms and recovery may be prompt; it must be remembered that cases which seem very mild, without marked symptoms, may yet become septicemic and fatal. Severe cases present vomiting, diarrhea, high fever, and cardiac and pulmonary symptoms of varying degree. Septicemia often results. These severe cases are usually but not always fatal.

The treatment depends upon the conditions as found on examination. Whatever can be done to build up the strength and the resistance to infection should be done. Local treatment includes cleanliness, antiseptic applications, and such measures as may be required for the relief of pain and the prevention of further injury to the skin.

**Prognosis.** The outlook is always rather gloomy; children with apparently mild symptoms may die. On the other hand, patients who seem very ill may recover with comparatively slight scarring.

## VERRUCAE

### (Warts)

These are small benign tumors, most commonly found upon the hands, face and neck. Children and young people are most often affected. They may be single or multiple. Each wart has a center or core of connective tissue, with variable hypertrophy of the papillae. The epithelium, capillaries and connective tissue all show hyperplasia, and there is often a brownish or yellowish or blackish pigmentation. They often disappear spontaneously and suddenly.

**Etiology.** While no infectious agent has been definitely described, there seems no doubt that some bacterium of very low pathogenicity is responsible for these strange growths. A single wart may appear, exist alone for some days or weeks, and then a crop of smaller warts may be found roughly encircling it. External irritation sometimes seems to exert some etiological influence.

**Diagnosis** is very easy; no other tumor of the skin presents the nodular, papillomatous appearance that is characteristic of warts.

### Types of Warts

**Verruca vulgaris** is the common wart found upon the hands and faces of children. It may be treated by freezing with carbon dioxide snow, applied about one minute. A blister is formed, with the wart above it. Cauteries remove the warts successfully, but they may leave bad scars, and must be used, if at all, only by those who are able to control the action of the cauterium skillfully. X-rays, to the point of mild dermatitis, and the violet ray, often remove the wart without causing any scar or painful after effects.

Repeated painting with tincture of iodine may cause them to disappear.

While the lesions seem definitely limited to the skin, and no constitutional symptoms are found, yet constitutional treatment often seems to facilitate the destruction of the warts. The digestion should be studied, and any tendency to constipation or to auto-intox-



ication corrected. General treatment, with especial reference to the lower thoracic and upper lumbar centers, is usually indicated, as the result of the examination of the affected child. Dietetic errors also must be corrected.

**Verruca planae juvenilis** is most common in babies and small children. These warts are usually numerous, and are found upon the face, neck and the backs of the hands. They may be very small, or may reach several millimeters in diameter. They may be roundish or roughly octagonal or roughly quadrilateral, with rounded corners. They are very slightly rounded at their first appearance, but grow larger and are very flat after the first few days. They have light yellowish or brownish color, and often present a shining appearance.

In the treatment of these flat warts the constitutional treatment, mentioned above, is distinctly useful. The warts may be painted with weak solution of salicylic acid in collodion, or the surface of the wart may be carefully painted with trichloroacetic acid or tincture of iodine.

**Verruca filiformis** is a thin, thread-like growth, usually upon the neck, face or eyelids. They may be a fourth inch long, but are rarely more than a line in diameter. They show less epithelial hyperplasia than do other warts, and pigmentation is less common. This wart can be clipped off with sterile fine scissors, and the base barely touched with silver nitrate or other cautery.

X-ray treatment is especially useful when the wart affects a finger nail.

Pedunculated warts may be clipped off with sterile scissors, and the base cauterized very slightly.

Warts may be softened by long soaking in hot soapy water and the superfluous tissue scraped or sandpapered. This is not to be advised for careless or unclean persons. Lactic acid, nitric acid, salicylic acid, or other similar applications may be made for the softening and removal of the wart, the destruction of the infectious agent, and the prevention of further growth.

Warts may disappear spontaneously, without recognizable cause, at any time.

### GRANULOMA ANNULARE

(Ringed eruptions; Lichen annularis; Sarcoid tumors)

This is a rare disease, usually found in children. It is characterized by several pinkish or whitish nodules arranged in a somewhat ring-like or crescentic line, usually upon the back of the hand over the knuckles. The nodules increase in size, and may be as large as a pea. The skin within the circle or crescent seems normal, or may show a slightly atrophic appearance. No itching or burning or other discomfort is noted, and no constitutional symptoms are found.

Very rarely the other joints of the body, the buttocks, face and scalp are affected.

Rarely the plaques are purplish or bright red. These are harder than the typical whitish nodules.

The nodules are not properly granulomata, but seem to be due to a chronic inflammation of the deeper layers of the skin.

Treatment is not required, and is practically useless.

After some months or years, the nodules are absorbed without leaving any evil effects.

## PART XI. THE ACUTE INFECTIOUS DISEASES

(Daisy D. Hayden, D.O.)

### CHAPTER LXXXV

#### Introduction

Children are especially susceptible to the acute infectious diseases, though they are not exclusively affected. Several preliminary considerations apply to these diseases.

An infectious disease is one due to the presence of bacteria or other organisms of simple type within the body. Diseases due to the presence of gross organisms or those of considerable complexity of structure are not called infectious. Tapeworms, hookworms and other parasites are not included in this category. Malaria is an infectious disease in this sense, as are scarlet fever, measles, pertussis and others.

A contagious disease is one transmitted by contact. Nearly all of the infectious diseases are also contagious. Malaria, an infectious disease, is not a contagious disease.

Not all of the acute infections are included in this section. Those infectious diseases which are particularly associated with any organ or system are included among the diseases of that system. Epidemic encephalitis, for example, is distinctly a disease of the brain and is, therefore, discussed with other brain diseases. Pneumonia is distinctly a disease of the lungs, and is properly included with other respiratory diseases. The diseases included in this section are not distinctly associated with any one part of the body.

After exposure to any infectious disease, or after the bacteria have gained entrance into the body, a period of incubation ensues. During this time the bacteria are, undoubtedly, undergoing multiplication and the various bacteriolytic and bactericidal powers of the body are resisting their growth and multiplication. No doubt in many cases this terminates the course of events leading to illness.

The period of invasion follows. The bacteria have overcome the resistance of the body, temporarily. Various symptoms follow, according to the condition of the body and the type of the infectious agent.

The period of eruption, in the case of the exanthematous diseases or the period of efflorescence or florition in non-exanthematous diseases, persists for a time, and is followed by the period of decline, during which all symptoms diminish in severity and, in the exanthems, the rash disappears and the epithelium desquamates. Convalescence follows, and this persists until the child has regained his usual health.

The methods of dissemination vary somewhat. The most common means of transmitting the disease from one child to another is by the excretions and secretions of the body of the sick child. Coughing, sneezing and blowing the nose permit minute droplets of mucous secretions to be scattered around. Even in talking, laughing and crying, there may be some scattering of the infection-bearing mucus. These particles may be dried and thus be killed, or they may retain their virulence for weeks or months. The pathogenic bacteria of different epidemics differ in vitality and in virulence, and the infectious agents for different diseases vary considerably in virulence, vitality outside the body and ease of transmission.

"Carriers" probably play a part in the transmission of the infectious agent in several diseases, but the importance of this method cannot be determined with any degree of accuracy. Carriers are individuals who suffer extremely mild forms of the disease, do not seem to be ill and thus scatter the infectious agent widely. No symptoms whatever are noted in some carriers, as is the case in typhoid carriers, or they may suffer negligibly.

Transmission by a third person or by various articles of clothing or by books is not possible, in many diseases, but this method is very important in spreading scarlet fever. Infections are carried by animals and insects. Cats and dogs which wander around the neighborhood, carrying fleas and entering various houses, are important factors in several diseases. Typhoid fever is carried by water and by insects. Malaria is transmitted by mosquitoes alone. Other methods of transmission are mentioned in connection with the diseases with which they are associated.

Fomites are passive carriers of the infectious agent. Toys, books, clothing and other articles may transmit the infectious agent of certain diseases and cause the disease in widely separated localities. Certain diseases are not transmitted by fomites.

The infectious agents for almost or quite all of the infectious diseases are present in considerable abundance. Not a very large proportion of those exposed to any such disease become ill with the disease. It is, then, apparent that in very few cases is the presence of the infectious agent the sole cause of disease. The conditions which prevent illness in the presence of the infectious agent are called factors of immunity. Perhaps it would be more logical to say that the factors which diminish immunity are factors which are concerned in the etiology of these diseases.

### Quarantine and Sanitary Provisions

In order to protect others, the quarantine of infectious diseases is necessary. In those diseases not quarantinable certain provisions are useful for the protection of the sick child and the protection of others from his disease. The following rules apply to those diseases



in which rigorous protection is necessary. They may be disregarded to some extent in diseases of low communicability. Different cities have different regulations for isolation and quarantine, and these must be followed with accuracy and discretion. In doubtful cases it is much better to err on the side of safety than to neglect some provision which might not be essential.

In hospitals the wards in which infectious diseases are treated are usually separated from other wards. In some cases this is not possible, and infectious cases are treated by the "box method." The walls of the box prevent transmission of particles of sputum from one bed to another. The nurses must use great care in such cases.

In a home a sick room must be set aside for the care of an infectious disease. This room is preferably located near the top of the house and if a bathroom can be set aside for the use of the occupants of this room, or if running water is conveniently at hand, the room becomes well suited to its purpose. The sick room must be so arranged as to be well ventilated, without drafts; well sunned, and yet capable of being shaded; and an anteroom is almost a necessity. This anteroom may be curtained off from the main hallway of the house, if nothing better is at hand. An adjoining room, with doors into the sick room and into the hall, is the best arrangement. The sick room should not be allowed to open into the hall. If it has a door into the hall, this door should be kept locked during the period of illness. The cracks should be stuffed with cotton.

The door between anteroom and hall must be kept closed. Between the anteroom and sick room and between the anteroom and hall sheets must be hung, with their lower ends always kept in vessels of a weak solution of carbolic acid, 5%, or bichloride of mercury, 1:1000. The antiseptics mentioned are probably of little value, but may prevent some bacteria from living. The damp sheets do catch much dust and lint; if they are not soaked in bichloride of mercury, carbolic or some other antiseptic solution an unpleasant odor of mustiness may result.

The windows of the sick room should be screened and open, if the weather permits. The windows of the anteroom should be open to some extent, in any weather, and should be as widely opened as conditions permit. In this way the sick room is separated thoroughly from the rest of the house. A fireplace or a stove in the sick room or the anteroom is very useful.

The sick room must not contain any hangings, carpets or furniture not subject to disinfection after the child recovers. Books and toys are almost necessary for children not very ill, and those who are convalescent. Toys made of paper or wood, or dolls of cloth or books with gay pictures may be provided at slight expense and

these can be burned when the child is well again. Duplicates may be required if he becomes considerably attached to the toys.

The nurse who cares for the sick child must not come in contact with other members of the family more often than is necessary. She should change her gown and cover her hair when it is necessary for her to see other members of the family. Extra gowns should remain in the anteroom for use in the sick room, and should be handed to her just before she changes to leave the sick room. Gowns for outside wear may be kept in the anteroom only if they are firmly bound in stout paper.

Food for the patient and the nurse should be left at the door of the anteroom. The nurse may wash the dishes in the sickroom and keep them there, if running water is convenient. Otherwise they should be paper or wooden dishes, be wrapped by the nurse in paper before they leave the anteroom, and be burned at once. If there is a fireplace in the room, paper or wooden dishes and paper napkins and tray cloths can be burned at once. The napkins used by the sick child are apt to contain the infectious agent abundantly. Handkerchiefs should be of paper or some cloth which can be burned as soon as it is soiled. Paper napkins are soft, cheap and easily burned.

Clothing and bedding from the sick room, the nurse's clothing and other articles removed from the sick room should be placed in a solution of carbolic acid or bichloride of mercury. A large vessel for this purpose should be kept in the anteroom. After the clothing has been soaking in an antiseptic solution for two hours or more, it may be wrung out and placed, still wet, into any convenient receptacle for the laundry. The clothes carry no dangerous bacteria after the soaking.

Sputum should be received in cups or paper which can be burned at once, preferably in the stove or fireplace in the anteroom. All urine, stools, washwater and discharges should be received in vessels which contain carbolic or bichloride of mercury solution. After soaking for a short time in this solution, they may be thrown into the sewerage system without danger.

The furniture, walls and woodwork of the sick room must be kept free from dust. A cloth, to be burned later, soaked in a solution of carbolic acid is best for dusting. A similar cloth may be used for the floor.

The nurse dresses in washable material, and keeps the hair covered with a cap or cloth (the cap must actually cover the hair). Before she leaves the anteroom she bathes in an antiseptic solution, rinses her mouth and throat with warm salt or boric acid solution, changes her clothing completely, and does not re-enter the sick room until she returns there to remain again for a time. She should not

loiter in the house, but pass directly into the open air. When she returns, she may stop for any necessary talk with other members of the family, but must at all times make such conversations very brief.

Those who care for the child during the absence of the nurse should bathe face and hands, in order to prevent carrying new infection to the child; leave their ordinary clothing outside the anteroom, slipping on a loose wrapper of some sort. This should be discarded in the anteroom and left in the hall outside the anteroom door. The gowns to be worn in the sickroom are left in the anteroom all of the time, and these must be washed frequently. When the member of the family who attends to this matter leaves the sick room, the gown is discarded, the wrapper donned again, and worn to another room, where the ordinary clothing was left. The hair must be carefully covered during the stay in the sickroom, both to prevent carrying new infection to the sick child and to prevent carrying infection from the sick room to other members of the family. The mouth and throat should be rinsed with a warm salt or boric acid solution, both before and after the visit to the sick room.

The osteopathic physician requires greater care than do physicians of other schools. He should keep a silk or linen gown or coat in the anteroom, a rubber or silk cap which completely covers the hair, and a cloth which covers the beard, if he wears one. A washable surgeon's gown is still better. The cap should completely cover the hair. He must wear rubber gloves while the treatment is being given. The thermometer, stethoscope and other instruments for diagnosis must be left in the anteroom or the sick room, and they must be sterilized before they are taken away. The nurse should sterilize the gloves after the physician's visit, and the gown and cap may be sent to the laundry after sterilization. The shoes are frequently neglected, in the processes of changing into and out of the sickroom. In cases in which the infectious agent is easily carried, the shoes must be changed when other clothing is changed.

Other children in the house should, if possible, be removed from the house. If they remain they should be kept far away from the sick room and should not approach the nurse. They should not go to school or play with other children until the incubation period of the disease has passed. If they must remain in the house with the sick child they must not go to school until the quarantine has been removed for the sick child. If several children in one family take any contagious disease in turn, the entire family may lose several months of school. If possible, the healthy children should go to live in another house, and then go to school as soon as the incubation period has passed.

When the child has recovered from the fever and the desquamation has ceased, and he has recovered a moderate degree of strength, he may be disinfected and permitted to leave the sick room. He

should have first a bath of warm soap and water, be rinsed, then receive the disinfecting bath; 1:10,000 bichloride of mercury is commonly used. The hair must be very thoroughly washed in the soap and water, very thoroughly rinsed in warm water and thoroughly soaked in the bichloride solution. It should be dried quickly, to prevent chilling. The clothing should wait in another room, and the child put on a clean wrapper while he passes from the anteroom to the new room. The wrapper is then to be added to the clothing from the sick room. All bedding and all remaining clothing then is to be placed in the usual solution in the anteroom, and then sent to the laundry. The sick room should receive a thorough cleansing in a disinfecting solution. Walls, woodwork, windows and all must be so cleansed. The room should be widely opened to the sunshine and wind for a day or more. It is then suitable for any ordinary use.

If the sick room is papered, this paper must be torn off before the walls are washed. All cloth of any kind must either be burned or else soaked in the disinfecting solution and sent to the laundry. Toys, books, or anything which the child has handled should be burned. If he has an affection for any toy, a duplicate should be ready for him.

Fumigation has had a great vogue, but it now seems doubtful whether any good results from the ordinary methods of fumigation. The penetrating odors of formaldehyde prevent too speedy use of the room and compel thorough airing.

To fumigate a room, the windows and doors and all other openings must be closed and the cracks plugged with cotton. The one who is to light the candle leaves the door open, then lights the candle, emerges hastily from the room, closes the door and plugs its keyhole and the cracks around the door with cotton. The room should remain unopened for twelve hours, at least. A thorough airing is necessary before it can be occupied. The size of the candle depends upon the size of the room; the candles can be bought properly labeled.

## TREATMENT

During the incubation period, if the child is known to have been exposed to the disease, he should be thoroughly examined and all abnormal conditions of any kind be removed, if this is possible. All vertebral, rib and other lesions should be corrected during this time. The bowels should be kept open, his hours of rest be respected, he should be taken from school and should not be allowed to play with children who have not been exposed. This is no time for surgery, and adenoids, bad tonsils, bad teeth and other conditions which require surgery may be allowed to remain unmodified. Any treatments which are indicated during this period are of great value.

If, after this precaution has been taken, he contracts the disease, the period of onset and the period of invasion are important. Dur-



ing the period of invasion two or three treatments should be given each day. The tense muscles should be relaxed, the articulations of the spinal column, the ribs and the clavicles tested and any lesions immediately but very gently corrected. If the child has received proper care during the incubation period or during the previous days of the epidemic, there should be no lesions of long standing, but only those caused by the inflammation and the reflex muscular contractions.

The mother should always understand that when any febrile disease occurs the child is to be given a bath and an enema and put to bed away from other children. If the condition seems serious, or if she anticipates the onset of an acute infectious disease she should call the doctor as soon as she recognizes the feverish condition; otherwise she may wait until the colon has been cleaned and the child resting in bed before she decides that a doctor is required.

Lesions of the upper thoracic vertebrae tend to increase the danger of cardiac involvement; lesions of the mid-thoracic vertebrae tend to increase the digestive symptoms. Lesions of the upper cervical and the upper thoracic cervical vertebrae tend to increase the seriousness of cerebral, eye and ear symptoms. Lesions of the eleventh and twelfth thoracic tend to increase the danger of renal disease. Lesions of the ribs and especially a rigid thorax tend to increase the secondary anemia which so often follows infectious diseases. The importance of securing normal structural relations before and during any acute infectious disease is evident from these considerations.

The muscular contractions and the edematous state of the tissues vary daily, and in acute cases, hourly. The more frequently the child is examined and any structural disorders found are corrected, the milder the course of the disease and the more complete the recovery.

The bowels must be kept clean. Enemas may be used as required. When the symptoms of toxemia are marked the drip method may be used. This softens hardened fecal material and permits it to be voided; adds to the water-intake of the body after the colon has been well cleaned, and increases the elimination of toxic substances from the blood.

Diet should be carefully guarded. During the fever a baby may be given his usual food, somewhat diluted according to the age and weight of the baby. Children of runabout age may be given abundant water, with or without fruit juices, or fruit juices only slightly diluted. The juice of pineapples, tomatoes and oranges is refreshing and nutritious. By giving freely of the fruit juices, with a small amount of sugar or none, the nutrition of the body can be maintained during the fever. It must be remembered that during fever the oxidation processes are extremely active, hence wasting is apt

to be considerable. The use of the small amount of fruit sugar in the fruit juices prevents a part of this wasting. The vitamins are necessary also in the metabolism of the body, both in sickness and in health. These are fully supplied in the juice of oranges and that of tomatoes and other fruit juices contain one or more of the vitamins.

During the fever no other food is permissible than the juices of fruit or tomatoes. These may be frozen if they are more appetizing in that form.

When the temperature exceeds 102.5° F. the hands, feet and limbs may be sponged with tepid water. No sense of chill should be permitted. If the fever is rising rapidly he may be placed in a tub of water at about 80° F. The cold pack is sometimes used if the fever is high and the child delirious. A rubber sheet is covered with several blankets, preferably the upper one of wool. Over this a sheet wrung out of tepid or cool water is placed, and the child laid upon this wet sheet. The sheet and blankets are then brought up around the child and he is covered closely in them. The blankets may be opened from time to time and the sheet sprinkled with cool water. This method has great praise from those who use it, but it has not a great number of advocates. When there is marked restlessness or delirium hydrotherapy or the application of an ice-cap may give relief.

If the osteopathic physician can visit the child two or three times a day, the fever can be kept under control in all but the most serious cases. Steady pressure over the tissues between the transverse processes from the sixth to the tenth thoracic vertebrae diminishes the fever and gives marked relief to the restlessness. In nearly every case areas of tense tissues and contracted muscles indicate the area in which the pressure should be applied. The relief of the tension is perceptible to the fingers making pressure and indicates the time when the pressure should be relieved. In the intervals between the physician's visits the nurse or the mother may give hydrotherapeutic methods according to instructions.

## CHAPTER LXXXVI

### ACUTE CONTAGIOUS FEBRILE NON-EXANTHEMATOUS DISEASES

This group of diseases is characterized by contagiousness, fever and characteristic symptoms but not by any typical exanthem.

#### WHOOPIING COUGH

(Pertussis; tussis convulsiva)

This is an acute infectious disease characterized by a severe prolonged cough which terminates in a long, vocal inspiration or "whoop", and which is usually associated with obstinate vomiting.

**Etiology.** Lesions of the first rib and the clavicle, the fourth to the tenth thoracic vertebrae, and, less commonly, lesions of the upper cervical vertebrae are predisposing factors. The thoracic lesions lower immunity in general, and the others interfere with the circulation through the upper respiratory tract. The most susceptible age is that between the first dentition and the second.

A specific bacterium, the bacillus pertussis, causes the disease in children predisposed or grossly infected. It is transmitted chiefly by contact, by way of the nasal and buccal secretions, and less commonly by fomites. One attack probably confers permanent immunity, though the characteristic symptoms may be present in certain nervous children with bronchitis.

No age is immune. Babies may be born with pertussis, and death may result from pertussis in old age.

**Diagnosis.** The incubation period is from three to ten days. The onset resembles an ordinary cold, with slight fever or feverishness, coryza, persistent cough, lacrimation and some photophobia. This stage persists for a week or two weeks, when the cough increases in severity and occurs in spasmodic attacks. Each attack includes fifteen or more short coughs without intervening inspirations. The coughs increase in severity in the series, cyanosis occurs, and then inspiration is forced and sudden. The glottis still being partly closed, this forced inspiration produces a whooping sound. These fits of coughing may occur only a few times daily, or they may reach a hundred or more each day. It is quite characteristic for the cough to be more frequent at night than in the daytime; this aids in determining the diagnosis.

In other attacks a small amount of mucus is coughed up at the last of a long series of short coughs, and the whoop may then be less prolonged. At other times several fits of coughing follow one another at short intervals; the child seems hardly able to get breath

enough to live, until a great amount of thin or thick mucus is expectorated. This brings relief, and several hours may intervene before another spell of coughing.

Any attack is apt to terminate in vomiting; this brings some relief, and the next attack may be postponed for several hours. In some cases the coughing fits are so close together, and so often followed by vomiting that the child becomes emaciated from starvation.

The attacks are very painful to witness. The child may realize that an attack is beginning and run to the mother for the help she is unable to give him. It may seem that the child will die from suffocation, in serious cases, and he may die from spasm of the glottis. Fear, crying or irritation in the throat may precipitate an attack at any time, and these conditions exaggerate the severity of an attack.

Between the coughing spells the child seems fairly well, and he plays around the room. In serious cases, in which starvation results from the frequent vomiting, the child is comfortable in the intervals, and sleeps or is semi-comatose.

After three to six weeks, usually about four weeks, the spasms of coughing diminish in severity and in frequency, with occasional severe attacks. The sputum becomes thinner and mucopurulent. The cough seems looser.

If the child is not carefully watched during this stage, there is great danger of complications. The heart, weakened by its long strain, may become permanently injured if the child, in his pleasure in being free from the fits of coughing, becomes too greatly fatigued. Slight exposure to cold may cause fatal pulmonary disease during convalescence.

**Treatment.** The measures already described for acute infectious diseases are indicated, with some special precautions. Careful and constant watchfulness is indicated. It is most unfortunate that this disease should be so often considered negligible, since its mortality exceeds that of any other acute infectious disease except diphtheria. The sequelae are serious, and may be fatal. For these reasons treatment should be early and vigorous. As in other infections, children should be examined and lesions corrected before an opportunity for exposure occurs, if possible.

Cases may be aborted by early and persistent treatment. The respiratory tract should receive special attention. Contracted thoracic muscles and rigid thorax should be relieved by raising all the ribs and by employing arm movements. Lesions of the first and second ribs and clavicle make the cough more severe; correction of these lesions gives marked relief. A spasm of coughing often fol-



lows a treatment, but this is the last for several hours afterward. Great quantities of mucus may be raised after a treatment.

A pad made of cotton may be placed over the pit of the stomach, and this held in place by a firm muslin bandage over the thorax and the abdomen. This bandage should not resist the movements of the ribs in coughing, but it should hold the abdomen firm and thus should support the diaphragm. Spasmodic coughing is often relieved in this way, and vomiting less often follows a coughing spell. The thighs of a little baby may be strongly flexed over the abdomen by the nurse; this gives some relief.

Inhalations of steam may prevent the onset of the paroxysm of coughing. Any fragrant oils, such as eucalyptus, cedar, lavender or mint, may be pleasant to the child and increase the amount inhaled.

I have found tincture of Bruzoni to give the greatest relief. One teaspoonful of the tincture should be added to one quart of hot water, and the child be permitted to inhale the steam.

The dangers of the period of convalescence can be avoided by giving the same treatments and the same nursing as that of the spasmodic period. Treatments are not indicated so frequently, and the treatment for the relief of the cough is less often demanded, but the lesions found should be corrected immediately, and no exposure or improper diet permitted during convalescence, any more than during the most acute stage of the disease. Only thus can the child recover completely, without tubercular or cardiac sequelae.

Isolation of children exposed to whooping cough is the only way of checking an epidemic. During an epidemic, any catarrhal symptoms should be considered the onset of whooping cough, until the symptoms have completely disappeared. During an epidemic, when such "colds" are followed by speedy recovery, having received early and persistent osteopathic treatment, it is very probable that at least some of these cases are really aborted cases of whooping cough. These aborted attacks confer immunity to the disease.

After recovery from a definite attack of whooping cough, the child should receive the same bathing and change of clothes as that already recommended.

**Complications and sequelae** may be serious or may be mild or absent. Bronchopneumonia is apt to occur in little children, and this may be fatal. The younger the child, the more apt is fatal bronchopneumonia to be associated with whooping cough.

Hemorrhages may be associated with the coughing attack. Bloody tears result from rupture of small blood vessels; epistaxis and hemoptysis are common. Bleeding from the ears occasionally occurs. Hematemesis and bloody stools are very rare. Cerebral hemorrhage is rare, but may cause hemiplegia or spastic paraplegia. Dr. E. S. Comstock reports sudden death from cerebral hemorrhage in pertussis in a case which had seemed very mild.

Polyneuritis is rare.

Anemia and emaciation often result from the persistent vomiting.

Aplastic anemia may follow whooping cough; this can only terminate in death. The secondary anemia due to starvation disappears with the ability to retain food.

Besides the bronchopneumonia so often associated with whooping cough in babies, other pulmonary complications are fairly common. Interstitial emphysema, pneumothorax, capillary bronchitis, lobar pneumonia and pleurisy are fairly common complications. Pulmonary tuberculosis and enlargement of the bronchial lymph nodes are often first noticed after this disease.

During the fits of coughing considerable strain is placed upon the heart. The pulse is small, irregular, and the right heart and the entire venous system are engorged and the valves may be seriously injured. This accident is more apt to occur in children who have suffered previously from rheumatism or scarlet fever, but it may occur in children whose previous health has been faultless. Heart strain may be considered serious in this disease if the face swells during an attack of coughing, and remains swollen for a few minutes after the whoop.

Nephritis is a rare complication, though febrile albuminuria and some glycosuria are usually present during the spasmodic stage of the disease.

## MUMPS

(Epidemic Parotitis; Epidemic Parotiditis)

Mumps is an acute infectious, contagious disease affecting the salivary glands, most commonly the parotid. It has special tendency to cause mastitis and orchitis.

**Etiology.** Predisposing causes include the lesions of the fourth to the tenth thoracic vertebrae, which lower immunity in general, lesions of the mandible, the hyoid and the upper cervical vertebrae. Any condition which lowers a child's vitality renders it more subject to mumps. Exposure to damp chilly weather is a factor. The disease is most frequent in spring and fall. Epidemics are not usually very widely spread, but may affect a considerable proportion of children in any one group, such as a Children's Home, or a hospital. The school age, from the fifth to the fifteenth year, is the time during which a child is most apt to suffer from mumps, though no age is exempt.

The infectious agent has not yet been isolated. The disease has been given to monkeys by a filterable virus from the saliva of persons with the disease. The virus seems to be transmitted by a third person or by fomites. The germ probably is carried from the mouth through Stenson's duct to the parotid gland, and thence by the

blood to other organs of the body. Isolation and quarantine should be continued for four weeks after the onset, in mild cases, and for three weeks after recovery in severe cases.

The infectious agent is found in the saliva, and thus is transmitted to other persons.

The contagious period probably begins before any recognizable symptoms occur, and thus the virus is widely scattered. Individual immunity is common, since comparatively few of the children exposed contract the disease.

**Diagnosis.** The period of incubation is long, rarely less than two weeks, and very rarely longer than three weeks. The initial symptoms are not distinctive. Light fever, chilliness and languor may or may not precede the local symptoms.

Aching, swelling and tenderness of the tissues around the angle between the ear and the mandible may be the first symptom noted. Occasionally pain under the jaw and spasm of the muscles of mastication on taking some sour or sweet food into the mouth is the first symptom. One gland alone is usually first affected, and the other gland is involved two to four days later. In some cases one gland alone is affected, and the other is left normal. The submaxillary and sublingual glands may be affected first, or after the involvement of the parotid gland, or not at all. The swelling usually fills the space between the mastoid process and the jaw, externally, and involves the inside of the mouth, the pharynx and the tonsils internally. The swelling persists for three to five days, then diminishes slowly.

Discomfort is invariable. Taking sour or sweet fluids into the mouth increases the secretion of saliva and causes great discomfort, with some contraction of the muscles of mastication.

The swelling usually affects the Eustachian tubes, and causes deafness, tinnitus or both.

Fever is not usually very high, rarely exceeding 102° F. Exceptionally hyper-pyrexia is present.

The blood shows both absolute and relative lymphocytosis. Even without symptoms of meningeal involvement the spinal fluid shows increased cell count, and the cells are lymphocytes.

On the fourth to the sixth day all symptoms diminish and the child should be perfectly well again by the tenth day.

**Complications.** Relapse may occur at any time within four weeks. The opposite gland may become inflamed at any time within five weeks, if it has not already been affected.

Orethritis is a common complication. It may appear during the acute stage of mumps, or after the parotid swelling has completely disappeared. An increase of fever is commonly associated with

orchitis. Occasionally the testicle alone is affected, and in some epidemics there seems to be marked tendency for the testicles to be affected; nearly half the boys with mumps may have orchitis in certain epidemics, while in other epidemics scarcely one is affected. If the inflammation is severe the testicle may become atrophied; if both testicles are affected, sterility may result. In some cases in which both testicles seem completely lost, sterility does not result.

Ovaritis and vulvular cellulitis may occur in girls with mumps. Mastitis, thyroiditis, pancreatitis and cervical adenitis occur in both sexes. In some epidemics a tendency to iritis, conjunctivitis and keratitis are common. Meningitis or encephalomeningitis are not common.

Polyneuritis, polyarthrititis, endocarditis and nephritis are rare sequelae.

**Treatment** includes the measures indicated in any acute infectious disease, plus certain other measures. The tension of the cervical tissues can be relieved by correcting the upper rib lesions and thus increasing the size of the thoracic inlet. Contractions and contracture of the anterior cervical muscles are always present, and these should be relieved. The treatment should correct every abnormal condition which might interfere with venous and lymphatic drainage of the affected glands and their surrounding tissues. The tissues can be very gently crowded toward the inflamed glands, and this frees the impeded lymph drainage and thus diminishes the edema and the pain. Relaxing work over the inflamed parotid and cervical glands gives excellent results. Undue pressure and bruising must be avoided. Deep work around the inflamed glands, beginning at the periphery of the edematous area and approaching closely around the glands is most effective.

Hot applications to the swollen areas may give relief; in other cases the ice-bag is better. Layers of cotton should be used to protect the swollen areas from chilling.

Orchitis is often caused by lumbar and lower thoracic lesions. It should not occur if the boy is properly treated and is kept in bed. If it should occur, the scrotum should be supported in a comfortable position, so that drainage is unimpeded. The lumbar and lower thoracic lesions which predispose to the inflammation should be corrected, and any tension which may be found around the pelvic tissues should be relieved. The inguinal and femoral lymphatics must be kept free from tension.

Mastitis is often caused by rib lesions, present in a child with mumps. Correction of the lesions is usually all that is required. Local treatment, crowding the tissues toward the inflamed glands, without direct manipulation may be necessary in severe cases. The axillary lymphatics should be kept free from any tension.



Meningitis must receive the treatment indicated in epidemic meningitis.

**Prognosis** is excellent for complete recovery, if osteopathic treatment is given early in the disease.

## INFLUENZA

(Grippe; Epidemic Influenza; Spanish Influenza; Contagious Catarrh; Epidemic Catarrh or Catarrhal Fever)

This disease is highly contagious, often occurs in epidemics and in pandemics, presents a wide variety of symptoms and tends to many complications. The specific infectious agent is a small, non-motile bacillus, first discovered by Pfeiffer and often called by his name. Quite typical attacks of influenza may be due to other bacteria.

**Etiology.** Lesions of the second to the seventh thoracic vertebra are important predisposing factors, and are found in nearly every individual who contracts the disease, whether the examination is made before or after he contracts the disease. Any other cause which interferes with the circulation or the drainage of the respiratory tract predisposes to influenza. Exposure to cold, especially to damp, chilly weather; living in poorly ventilated rooms, and the presence of adenoids and of badly diseased tonsils are common causes of respiratory disorders, and thus predispose to influenza.

In some epidemics children are almost immune, in others children are affected as often as adults. During an epidemic or a pandemic a great many persons contract the disease, though probably a comparatively small proportion of those exposed to the disease are affected.

The bacillus is found abundantly in the nasal secretions and the sputum, and is transmitted from one person to another by sneezing and coughing especially, and also by other methods. The dried particles of sputum may be transmitted in the air to some extent. Fomites do not seem to carry the disease to any great extent; handkerchiefs and such articles which have been soiled by nasal secretions and sputum carry the active bacilli to others who handle them.

In some epidemics the influenza bacillus is found only rarely in the sputum of those suffering from influenza, and other organisms are found abundantly. *Micrococcus catarrhalis*, *pneumococcus*, *staphylococcus*, *bacillus mucosus capsulatus*, *streptococcus hemolyticus* and several other organisms are frequently found, either in pure culture or variously associated. No one of these has been found to produce typical symptoms of influenza at other times than during an epidemic of grippe, hence the biology of influenza remains somewhat confusing.

**Symptoms.** The incubation period is short, rarely exceeding four days, and often being one day in duration. During the incubation period there are usually pains in different parts of the body and anorexia.

The onset is rather sudden, with chilliness and high fever. Convulsions are rather common. Pains in the back, legs and head may be very severe. Little children cannot describe these pains, but their discomfort is manifest. Prostration is severe. Several types of the disease are described, all of which have about the same symptoms at onset.

Typical grippe shows an irregular fever, varying from about 100° F. to 105° F. If the course of the disease is not modified by treatment, the temperature falls by crisis, or by a rather rapid lysis, on the third or fourth day. The respiration and pulse vary with the temperature. Vomiting and diarrhea are present, and may be marked. Varying degrees of coryza, bronchitis and pharyngitis are present.

The urine shows the usual febrile condition. The blood may show leukocytosis if pyogenic bacteria are present. In the epidemic of 1918 leukopenia was almost invariable. In almost any case of grippe without a pyogenic complication there is a neutrophilic leukopenia.

The typical attack persists for four to six days, but the prostration and aching or neuralgic pains usually persist for several weeks.

Mild cases have about the same onset, but the fever does not rise above 101° F., the child may not be sick enough to go to bed, and there is little or no aching. Prostration is greater than the severity of the other symptoms can account for, and this alone may suggest that a slight and temporary feverishness is really grippe.

Severe cases show prolonged and variable fever, increased pain, and very great prostration. Such an attack may drag along for weeks, and be followed by prolonged and eventful convalescence. Babies suffer often from severe vomiting.

In the catarrhal or respiratory type, coryza is severe at the time of onset, and persists for several days. The throat is very sore, and the tonsils show follicular inflammation. Stomatitis is common. Laryngeal cough is followed by bronchial cough as the inflammation descends. Cervical adenitis and otitis are common complications of this type. Symptoms of spasmodic croup may appear when the larynx is severely affected. This type is rare among small children, and is more common than other forms in older children, as it is among adults.

Gastrointestinal influenza or grippe is characterized by the usual onset, but the digestive symptoms predominate during the entire

course of the disease. Nausea, vomiting, diarrhea and abdominal pain are severe. The stools contain abundant mucus and often some blood. Unless an epidemic is present this form is usually considered a form of gastroenteritis. In babies, especially, there may be intestinal toxemia and great prostration, but no vomiting or diarrhea. The appetite is always lost, and the child may refuse food altogether.

In the nervous type of influenza the onset is as usual, but the nervous symptoms become profound. Apathy may be followed by stupor. Hyperpyrexia, convulsions, coma and delirium may suggest meningitis. A typhoid state occurs in other cases. Toxic dyspnea, persistent fever and prolonged convalescence are characteristic of the nervous form of influenza. Meningitis is a common complication. This type is especially frequent in small children.

**Complications** are rare in osteopathic practice. Bronchitis may be very severe in young children. It is usually associated with the respiratory type of the disease.

Bronchopneumonia is a common and often fatal complication. Lobar pneumonia occurs more often in older children, and is less often fatal. Pneumonia following grippe is usually prolonged and of the wandering type. Leukopenia may persist even during lobar pneumonia in influenza cases.

Otitis media may be purulent, catarrhal or hemorrhagic. Mastoiditis is common, and perforation into the meninges may result in death from meningitis. Deafness may result from the otitis.

Ocular symptoms are usually limited to the mild conjunctivitis of the onset.

Cervical adenitis is a common complication or a sequel. The amount of glandular swelling is much greater than the other symptoms suggest, and prostration is usually extremely pronounced in these cases. Meningitis may be due to invasion of the meninges by the influenza bacillus or by other organisms associated with the influenza bacillus in any case. Mental disturbances, chorea, encephalitis and spastic paralyses may follow grippe, and are probably due to invasion of the pia mater by the influenza bacillus or some associated bacteria.

Nephritis, peritonitis, cardiac dilatation, herpes, erythema urticaria and morbilliform or scarlatiniform rashes are rare complications or sequelae.

Relapse and recurrences are common. The attack confers a very temporary immunity, and afterward the child seems predisposed to further attacks. These are much less common in osteopathic practice than in medical practice.

### Treatment

Prophylaxis is difficult. The infectious agent is contained in the nasal secretions of many persons who show no other evidences of the disease. After recovery, the bacillus may remain for months in the nasal secretions. The sick child should be quarantined according to the directions already given, and during an epidemic children should not be allowed to congregate in groups, nor should they be permitted to go to public places. Moving picture theaters are especially dangerous as places for scattering any infection, on account of the poor ventilation and the close association of the children.

The value of osteopathic treatment is definitely indicated by the study made by Dr. George W. Riley during the epidemic of 1918. By a study of 110,122 cases reported by 2445 osteopathic physicians the comparative mortality of influenza under osteopathic care and the mortality under medical care was determined. The influenza mortality under osteopathic care was found to be one-fourth of one percent, or 257 deaths in 110,122 cases; 6,258 cases of epidemic pneumonia were reported, with a mortality of 635 cases, or about 10%.

Medical statistics give a mortality of 10 to 15% for influenza and a mortality for epidemic pneumonia of 25 to 65% of all cases.

The osteopathic treatment which gave these important results is simple. The general care already advised was usually employed. The child must not be allowed to lie for more than half an hour or so upon the back. If nervous symptoms occur he must not lie upon the back at any time, but must lie upon one side or the other, in different positions.

All tension around the thoracic inlet must be relieved. The tissues of the anterior areas of the neck are almost always tense and edematous; this condition must be relieved by the usual manipulations.

The lesions of the upper thoracic region already mentioned in the etiology must be corrected after the disease has begun, if this work has not already been done. As in other infectious diseases, half the battle is won if the child can receive such treatment as he needs after exposure or during an epidemic before the symptoms of the onset. Lesions of the second to the fifth thoracic vertebrae and the corresponding ribs predispose to cardiac disorders; these must be carefully corrected and examined daily lest they recur. Occipital lesions predispose to nervous symptoms; upper cervical lesions to otitis, these must be avoided. Such lesions are apt to recur during fever or toxemia, and daily examination of these tissues is indicated. Any recurrence of the lesion and any appearance of a lesion before unrecognized should receive immediate attention. Lesions which appear or which recur during the course of an acute disease are easily corrected, with little or no discomfort or annoyance to



the patient. The treatments should, as in all acute diseases, be rather short. It is necessary to be especially careful to avoid fatigue in treating influenza cases, since the toxemia in influenza so greatly resembles that of fatigue in its effects.

The throat may be irrigated or the patient may gargle if he is strong enough. Half-saturated boric acid may be used for a wash, but should not be used for irrigation or as a gargle. Lemon juice or pineapple juice diluted to taste can be used as mouth wash, or for irrigation or as a gargle. Either of these gives a clean and refreshing sensation, and either is as useful as a cleansing agent as other less pleasant solutions.

The nasal membranes may be cleansed with any oil or cream; 2½% of iodine in olive oil is advised by Dr. McCole.

**Prognosis.** If a child receives occasional osteopathic examinations and is kept in good mechanical condition, he may escape infection altogether. If osteopathic treatment is given at the onset, the symptoms should be fairly mild and no complications appear. The mortality at this time is practically nothing. If osteopathic treatment is delayed until the third day or later, and the symptoms are severe, recovery is still to be expected, but complications may arise and the disease be fatal from these.

If osteopathic treatment be delayed until pneumonia has become well developed, the prospect is still much better than in ordinary cases under medical treatment. The mortality in such cases is about 10% in osteopathic practice and considerably more in medical practice.

## DIPHTHERIA

This is an acute infectious disease characterized by a membranous exudate upon the fauces and other mucous membranes, and by constitutional symptoms due to the toxic products of the bacillus diphtheriae commonly called the Klebs-Loeffler bacillus.

**Etiology.** Contraction of the scaleni is an important factor in causing congestion of the tissues of the throat, by diminishing the size of the thoracic inlet. Other anterior cervical muscles may be concerned also. The scaleni were emphasized in this connection by Dr. A. T. Still. Lesions of the mid-thoracic vertebrae and of the upper cervical vertebrae are also concerned in predisposing to infections of the throat. Catarrhal inflammation of the nose and throat, tonsillar disease and other acute infectious diseases are important predisposing factors also.

The infectious agent is the Klebs-Loeffler bacillus. It is found abundantly in the false membranes and in the nasal and buccal secretions. It does not usually invade the mucous membranes, and is rarely found in the blood or the internal organs, even in fatal cases.

It is not often found in the false membrane nor on adjacent mucous surfaces two weeks after the onset of the disease, and very rarely are any bacteria found four weeks after the onset of the disease. Carriers are fairly abundant, and during an epidemic almost any person, sick or well, may give a positive bacterial culture. The bacteria thus preserved may initiate an epidemic, or may be responsible for the few sporadic cases. Even when no epidemic is present, a few well persons carry bacteria which cannot be differentiated from the Klebs-Loeffler bacillus by any known methods of study.

Pseudo-diphtheria bacilli do not differ from the Klebs-Loeffler bacilli in morphology, but they do not ferment dextrose nor do they produce toxins.

Mixed infections are common in diphtheria. Streptococci are almost always present in the throat with the Klebs-Loeffler bacillus. Several other pyogenic bacteria are commonly present, and these are undoubtedly responsible for some of the sequelae of diphtheria, such as cervical adenitis, middle ear abscess and bronchopneumonia.

Individual immunity is very common. Babies less than a year old are very rarely attacked. Comparatively few of the children who are exposed to diphtheria contract the disease. The disease confers only a very temporary immunity and yet epidemics are comparatively rare.

Diphtheria is diminishing steadily in frequency and in severity, but this change is much less marked than is the case in scarlet fever. A part of the diminishing mortality in diphtheria is due to the fact that since the recognition of the Klebs-Loeffler bacillus many mild cases are included in the diphtheria statistics which were, previously to that time, not so included. Another cause for this improvement is found in the methods of treatment. After the recognition of the bacillus, the previous methods of removing the membrane forcibly, by the use of special instruments or by cautery, were discarded. The previous custom of administering very heavy doses of opiates, alcoholic stimulants and mercurial drugs passed away at about the same time. By the removal of these drastic methods of treatment many lives have, no doubt, been preserved.

#### Pathology

The characteristic tissue change in diphtheria is the development of the false membrane. This is almost always found in the upper respiratory areas, but may be found any place in the body.

This membrane varies in color, being whitish, grayish, yellowish, dark gray or almost black, according to the amount of blood in the membrane and the amount of fatty degeneration which has occurred. The membrane is tough and is firmly adherent to the underlying tissue. When it is forcibly removed, as it was removed in the treatment of diphtheria before the recognition of the specific bacillus, the underlying mucous membrane was stripped and an open wound left at the site of the membrane.

The false membrane is formed in a somewhat complicated manner. First, the epithelial cells of the membrane perish, become degenerated and undergo necrosis. They may break up, forming a granular debris, or they may form a hyaline mass. Fibrin and fibrin ferment enter this mass, on account of the inflammatory reaction to the bacterial toxins if not to the bacteria themselves. The fibrin coagulates around and among the degenerated epithelium. Red and white blood cells are concerned in forming the exudate and they are enclosed in the coagulated fibrin. The membrane thus formed is extremely adherent to its base. The membrane does not form on normal mucous membrane, but, having formed, it may overlie, destroy and thus invade neighboring membrane originally normal. Apparently, at least a slight abrasion is probably required for the initial formation of membrane. The tissues beneath the injured mucous membrane undergo inflammatory or degenerative changes, and they may, rarely, become gangrenous.

Nearly all the organs of the body are affected by the toxic substances resulting from the growth and metabolism of the bacteria. Cloudy swelling, hemorrhagic areas, fatty degeneration and necrotic areas may be found in the heart, liver, spleen, kidneys, adrenals, muscles and sometimes the peripheral nerves, when postmortem examinations are made.

The diagnosis rests upon finding the characteristic bacilli in the affected area, usually the throat. By a swab, the infectious agent is transmitted to a culture medium and this incubated for one to two days. Usually the growth is typical in 24 hours.

The symptoms are fairly characteristic, but are not definitely pathognomonic in all cases.

The period of incubation is short; occasionally the onset appears within 24 hours of the exposure, usually it appears about three days after exposure, and occasionally a week may intervene between undoubted exposure and the onset.

The onset is rapid but not usually abrupt. Chilliness, malaise, muscular soreness and a general aching, nausea and vomiting are commonly noted. In some cases the sore throat is the first symptom. The further history varies according to the location of the membrane.

### Types

**Faucial diphtheria** is the most common form. The neck is stiff and the throat sore; there may be pain on swallowing. On examination, the tonsils, palate, uvula and posterior wall are seen to be considerably reddened and edematous. Within a few hours after the onset, small patches of the pseudo-membrane are found on some part of the throat, most commonly on the uvula or the tonsils. These patches tend to spread with considerable rapidity and to coalesce. The visible part of the throat may be completely covered within two days after the first symptom. It may extend into any of the communicating cavities, but only rarely invades the esophagus. Mucous or mucopurulent discharge is abundant, and the odor may be repugnant. The tongue has a thick coat, usually yellowish.

The submaxillary and cervical lymph nodes are swollen, and the

tissues of the neck may be so swollen, in severe cases, as to distort the form of the neck and jaws.

The severity of the constitutional symptoms does not seem to bear any relation to the extent of the membrane in the throat. A mild case may be associated with either extensive or comparatively slight amount of the false membrane, and cases with apparently mild symptoms and slight involvement of the throat may terminate suddenly in death from the toxic products of the bacterial growth.

Generally speaking, the constitutional symptoms are not pronounced during the course of the disease. Pallor, muscular weakness and aching are usual. Vomiting may occur during the onset, but rarely occurs later. Severe vomiting during the height of the disease suggests impending heart failure. The temperature rarely exceeds 103° F., and is usually about 101° F. The pulse is rapid, usually about 100 to 130, and it may become irregular during the height of the fever. Bradycardia suggests impending cardiac failure. Nervous symptoms are not common. In very severe cases a typhoid state, with low delirium, may be present.

**The urine** is that of fevers in general, with some albumin, renal epithelium and casts. Nephritis is a rare complication, and is very rare as a sequel of diphtheria.

**The blood** shows secondary anemia after the height, and moderate leukocytosis during the progress of the disease. In mild cases leukocytosis may not occur on account of the mildness of the infection. In fatal cases leukocytosis may not occur because the infection overcomes the leukocyte-forming tissues.

The disease usually persists for ten days or two weeks. In cases with severe complications recovery may be postponed for several weeks longer.

**Laryngeal diphtheria** (True croup; membranous croup; pseudo-membranous croup). The involvement of the larynx by the membrane originating in the pharynx is a common occurrence. In about one out of five cases the larynx is first affected, and it is this condition which is called laryngeal diphtheria.

The onset resembles that of faucial diphtheria, but the voice is very hoarse and the cough dry and brassy or metallic. Evidences of stenosis usually follow shortly, although in some mild cases no respiratory impediment is recognized. The dyspneic attacks may appear at intervals, or there may be no easy breathing at all. Both inspiration and expiration are prolonged and a wheezing or whistling sound may occur. As the obstruction increases evidences of impending suffocation appear. The child may toss about, throw the head back, employ all the accessory muscles of respiration, and grasp at the throat or at the bed-clothing. The face is very anxious, slight cyanosis appears and the skin becomes damp and clammy



with sweat. The false membrane may be expelled by coughing or it may come loose without apparent effort. Intubation or tracheotomy may relieve the condition at this time. Unless the condition is in some way relieved, the child becomes weaker, stuporous and comatose, the pulse becomes weaker and more irregular and death occurs speedily.

A violent attack of coughing often removes the membrane forcibly, and recovery may be rapid after this has occurred. In other cases the forcible removal of the membrane with coughing causes the bacteria to be inhaled, and bronchopneumonia results. This is usually fatal, especially in smaller children. The bacteria found in the lungs in such cases are usually some of the pyogenic bacteria, though sometimes the Klebs-Loeffler bacillus can be found post-mortem.

Laryngeal diphtheria is usually associated with less marked constitutional symptoms, less frequent paralysis and more rapid recovery than is the faucial type.

**Septic diphtheria** is due to secondary infection by any of the pyogenic organisms, usually a streptococcus. The membrane is then very extensive, is associated with the secretion of great amounts of mucus, and is darker in color and extremely foul of odor. The amount of mucus may be so great as to interfere with respiration and deglutition. Suppuration is common and sloughing may occur. The fever rises to a high point, as in other septic states, prostration is severe and the child is very apt to die. In a few cases recovery occurs after a long and tedious convalescence.

**Malignant diphtheria** (black diphtheria) is rarely seen during recent years. The onset is abrupt and severe, the face becomes very pale and edematous, the pulse extremely weak and feeble, hemorrhages occur into the subcutaneous and submucous tissues, there is nosebleed, sometimes hematemesis, and blood may be found in the stools in some cases. Death is to be expected within a day to three days, after some hours of stupor.

**Nasal diphtheria** is most commonly found in babies. The term is not applied in these cases in which the membrane extends from the fauces or pharynx into the nasal passages, but only when the nasal membrane is first affected. The nasal discharge is profuse, acrid and sometimes ill-smelling. No membrane may appear, and only the bacteriological examination makes the diagnosis definite. The skin around the nostrils is usually eroded by the discharge. If an epidemic of diphtheria is present, nasal diphtheria may be suspected by the character of the discharge. Other children in the family may contract typical diphtheria from the baby.

Nose breathing is impossible. Sometimes the false membrane may be found as a cast of the nasal passage. The inflammation

rarely extends to adjacent passages. The constitutional symptoms are not marked, and paralysis rarely follows this type of diphtheria.

**Membranous rhinitis** (fibrinous rhinitis; chronic nasal diphtheria) is a rare and strange condition. It bears little resemblance to diphtheria, and does not seem to be contagious. A false membrane appears in the nasal passages, and a considerable amount of mucus is secreted. Constitutional symptoms are slight or absent. The Klebs-Löffler bacillus can be found in the nasal secretions and in the membrane, which alone causes this disease to be included with the diphtherias.

**Latent diphtheria** is common. Coryza, sore throat or tonsillitis may be present in mild degree. Rarely other children contract the disease. Very rarely some peculiar paralysis follows the mild symptoms. The bacillus can be found in the throat and in the nasal secretions. During an epidemic of diphtheria nearly all sore throats and a considerable proportion of normal throats give cultures of the Klebs-Löffler bacilli. These are much less often found when no epidemic is present and it seems very probable that they are the bacilli of diphtheria which have, in some manner, lost their virulence.

### Complications

Complications include bronchopneumonia, which is usually fatal; and lobar pneumonia, which is rare and which is not necessarily fatal.

Heart failure is the commonest cause of death from diphtheria. It is apparently due to the toxic products of the bacteria, but may be in part due to the improper use of drugs. Heart failure is impending when the limbs become chilly, a clammy sweat appears, the pulse becomes irregular and the heart beat weak. Heart failure may be preceded by violent vomiting and pain or tenderness over the epigastrium. Bradycardia also suggests heart failure. Endocarditis is rare. The cause of death seems to be degeneration of the heart muscle and of the bundle of His.

Diphtheritic paralysis is rather common in some epidemics, but rare in others. It is more common after antitoxin has been used. The paralysis is usually due to toxic neuritis. The pharyngeal and palatal muscles are most commonly involved. Tubal feeding may be necessary after the child has recovered from the diphtheria. The eye muscles are also often affected. Strabismus is a common sequel. Lack of accommodation, due to paralysis of the ciliary muscles, is an unfortunate result of diphtheria. Paralysis of the respiratory muscles may cause death. Aspiration pneumonia and suffocation due to the impaction of a foreign object may be due to paralysis and thus cause death some weeks after the child has recovered from the diphtheria itself.

Cerebral paralysis, hemiplegia, acute nephritis and otitis media are rare complications or sequelae. Destruction of the cornea, optic neuritis, gangrene of the limbs and purulent tonsillitis are also rare in diphtheria.

### Treatment

The isolation and quarantine measures already described should be enforced vigorously. Especial care is necessary to prevent the child from spreading the disease after his recovery from the serious symptoms. Quarantine must be maintained until two negative cultures have been taken from the throat, at least a day apart, or for three weeks after the fever has disappeared. Cats and dogs suffer from mild forms of diphtheria, and they transmit the infection.

The children who have been exposed, or who are likely to be exposed to diphtheria should receive careful examination, and all lesions corrected. Any unhygienic conditions of living should receive attention. During the epidemic of diphtheria children should not be allowed to attend theaters, picnics or any other place where many children congregate. The disease is very easily transmitted if children put pencils or other articles in the mouth, lending and borrowing indiscriminately, or if they share drinking utensils or other articles which come into contact with the mouth.

When symptoms of the onset of the disease occur, the child should be put to bed in the room selected and isolated as the sick room. The child must not be permitted to lie upon the back, nor to lie with the neck turned in an awkward manner. Lesions of the upper thoracic vertebrae and the upper ribs predispose to heart weakness, and these must be kept corrected. There is a tendency for lesions to recur during progress of any acute disease, and diseases characterized by toxemia are especially prone to cause recurrence of lesions.

The splanchnic centers should be kept normally active, through corrective work over the lower thoracic spinal column and the lower ribs. Any tension of the ribs over the liver and the spleen must be relieved. The lymphatic and venous drainage of the head and neck region must be kept free.

Rectal tension is very common when pharyngeal irritations are severe. The relaxation of the sphincters thus reflexly contracted gives much relief.

Toxemia is diminished by steadfast adherence to fruit juices and vegetable juices as the exclusive diet during the onset and the height of the disease. With beginning recovery, milk, whey, buttermilk, barley water and soups made of vegetables can be given. No meat or meat broths should be given until at least two weeks after all symptoms have subsided.

**Local treatment** must be carefully given and is very useful. If the cervical lesions have been corrected before the onset of the

disease, no severe ones can be found at the examination, but there are usually some recurrences of the lesions. These must be corrected once or twice each day, as they recur. The deep muscles of the throat must be relaxed; they are almost always somewhat contracted in this disease. Direct treatment of the tissues over the stellate ganglion, the middle and the superior cervical sympathetic ganglia, and the tissues around the thoracic inlet is usually required. Tension of these tissues is almost invariable during diphtheria. Hot applications to the neck may give relief in some cases. In others an icebag is more useful and pleasant to the child.

Any mild germicide may be used for a spray or a nose or mouth wash. Dr. McConnell uses bichloride of mercury, 1:4000 as a spray. Pineapple juice, diluted and sterilized by boiling, is a good mouth and throat wash. It leaves a peculiarly pleasant feeling and taste in the mouth. The water and fruit juices may be iced or warmed, as is most comfortable. Bits of ice in the mouth may give relief.

In the laryngeal type, a croup kettle or some modification of this may give great relief.

All treatment should be given in such a way as to avoid causing the child to cry or to struggle. Much patience and time may be necessary in order to secure the desired results without causing harmful struggling.

Irrigation is sometimes better than spraying. The nozzle of the irrigatory must be covered with soft rubber tubing, and this held in a horizontal position, as the child sits with the head slightly forward. Hot normal salt solution is usually grateful, or 2% boric acid solution.

When the child is first seen after the throat is badly affected, when there is danger of suffocation, intubation may be required. An intubation set is necessary. The tube is passed into the throat along a finger, and is guided into the larynx. If it does not pass immediately the finger must be withdrawn and another trial made. The thread must be fastened to the cheek by strips of adhesive tape. If the tube is coughed up, it may be left out until further suffocation occurs, then a larger tube may be inserted; if this is coughed up and the suffocative attack again recurs, tracheotomy may be necessary. Tracheotomy is indicated when the membrane has invaded the trachea, and the tube does not give relief.

Tracheotomy is the insertion of a tube through an opening made through the skin and tissue of the neck and into the trachea. The services of a surgeon should be secured. Unskilled efforts at tracheotomy may give temporary relief, but death is apt to follow within a few days from some complication.

**Antitoxin** treatment for diphtheria has an innumerable number of advocates. No doubt the use of antitoxin rather than the forcible



stripping and cauterization of the affected area, the common treatment of diphtheria before antitoxin was discovered, is a very great advantage. With the first use of antitoxin, the strenuous purgatives, heavy doses of opiates, very large doses of brandy and other alcohols were no longer employed in treatment. The statistics usually quoted are derived from the cases treated by these radical measures before the discovery of antitoxin, as compared with a study of the cases treated by antitoxin without those measures. It is true also that before the recognition of the diphtheria bacillus (Klebs-Löffler) cases of very serious symptoms alone were called "membranous croup" or diphtheria, while after the discovery of that bacillus very many mild cases were included in the diphtheria statistics. These facts are not stated as an argument for or against the use of antitoxin, but only to call attention to a misuse of statistics which may be responsible for much misunderstanding.

Antitoxin is used to combat the poison produced by the bacteria, after they have gained entrance into the throat and are producing symptoms. Commercial preparations are on sale, and the technique of administration is given with each preparation. Antitoxin for diphtheria is prepared from the serum of a horse which has received many doses of diphtheria toxin, and has thus prepared the antitoxin for that toxin. It is extremely important that the serum be properly prepared, and the horses properly cared for, or the antitoxin becomes an extremely dangerous preparation.

When the patient receives antitoxin on the first day, if the fauces are the site of the disease and the symptoms are mild, a subcutaneous injection of 5,000 units is given. If the treatment is postponed until the second day, 10,000 units are given. Laryngeal diphtheria usually receives twice these amounts. Nasal diphtheria receives three times the dose for mild cases of faucial diphtheria. In any case if improvement does not follow within twelve hours, a second and much larger dose is given. In very serious cases, the initial dose may be 20,000 units or more, and if improvement is not noted in six hours, twice the initial dose is given. As much as 200,000 units have been given altogether, divided into several doses. In extremely malignant cases, with profound toxemia, the injections are intravenous. This method is advised by some authors for all cases.

Several harmful results occasionally follow the use of antitoxin. These are rather rare, but must be considered possible. Serum sickness may be due to the injection of any foreign proteid into the body. Its symptoms include vomiting, nausea, general edema, prostration, pains in the joints and the bones, and various skin eruptions, such as urticaria, erythema or other less common rashes. Anaphylactic shock occurs most commonly in asthmatics, and especially those in whom contact with horses has previously caused urticaria, asthma or spasms of sneezing. Children in whom there is no history

of asthma may suffer from anaphylactic shock, and give symptoms of severe dyspnea, cyanosis, general edema, respiratory failure and death within less than an hour after the injection of the serum. This accident is not due to improper preparation of the serum.

**Schick test.** This is used to determine whether a child is immune to diphtheria. This is an injection of a very minute amount of diphtheria toxin into the skin; not into the subcutaneous tissues. If the child is immune, no reaction occurs. If he is not immune, an area of inflammation occurs about two days after the test was made, and this persists several days, leaving a coppery stain which lasts several days longer. Children giving a positive reaction to the Schick test are given from 500 units to 1,000 units of antitoxin, according to the age of the child. Another injection of an equal amount is given not more than five days later, and a third nine days after the second injection. The first two are given at short intervals in order to prevent anaphylactic phenomena. Children so immunized do not give a positive reaction to the Schick test; if, very rarely, one does still give the positive reaction, an increased amount of antitoxin is given. The protection thus given lasts for about three years.

Nearly half the children tested in this manner give no reaction, suggesting an immunity to diphtheria. About 85% of adults give negative findings, whether they are known to have had diphtheria or not.

**Prognosis.** Epidemics differ greatly in the mortality rate. The prognosis should always be guarded, even in light cases, since cardiac failure may occur at any time. Before the discovery of the typical bacillus and the enforcement of quarantine, epidemics of diphtheria or membranous croup were widespread and terrible. The mortality rate in these epidemics, based upon the very severe cases only, with the drastic drug treatment and the forcible removal of the membranes, reached 70% or more. Mild cases were, of course, not included in the diagnosis of diphtheria and hence did not affect the statistics. In membranous croup (laryngeal diphtheria) the mortality is now, with antitoxin treatment, about 35%. No statistics are available of cases of diphtheria treated without antitoxin.

The probability of diphtheritic paralysis cannot be determined.

## CHAPTER LXXXVII

### ACUTE INFECTIOUS FEBRILE DISEASES NOT ORDINARILY CONTAGIOUS

In this group of diseases the infectious agent may be transmitted from one person to another by means of the excretions or secretions of the body, by experimental methods or in other ways, but the disease is not transmitted easily and abundantly from one to another. With the exception of the typhoid group, these diseases do not occur in epidemics. All are characterized by fever. In several of these diseases some animal is important in causing or in transmitting the infectious agent.

#### ERYSIPELAS

(St. Anthony's Fire; The Rose)

Erysipelas is an acute infectious disease characterized by inflammation of the skin with marked edema. It is less common during childhood than during adult life, and in childhood is most common during the first year of life. The erysipelas of the newly born presents certain variations from the type in later infancy and childhood.

**Etiology.** Wounds are essential to the entrance of the bacterium. Small lesions of the nasal mucous membrane occasionally permit the invasion of the bacteria.

The infectious agent is a streptococcus, often called the streptococcus erysipelatus. It is not possible to distinguish between the streptococcus which causes erysipelas and other streptococci which cause general sepsis, abscesses or certain other conditions. It now seems probable that this is a strain of streptococcus hemolyticus which has attained a certain peculiar type of virulence.

#### Erysipelas in Childhood

Predisposing factors include lesions of the upper cervical vertebrae, the first rib, the clavicle and the mandible, in facial erysipelas, and lesions of the fifth to the tenth thoracic vertebrae, in any case of erysipelas.

Malnutrition, rickets and unhygienic surroundings are probably predisposing factors.

After any injury which has been associated with infection, a period of fifteen to sixty hours may elapse before any symptoms of erysipelas occur. The site of the wound then becomes reddened and the surrounding skin is swollen. Blebs may arise, and these become purulent. Fever rises to 103° F. or more, but the initial chill so often present in adults is not often noted in children. Vomiting is almost

always rather severe, at first, but usually disappears on the second day. Delirium is frequently present during the high fever. The fever is remittent or persistently high for three or four days, then falls by crisis or a rapid lysis. Relapse of the fever may occur, with or without extension of the cutaneous process. The condition is much less severe in babies more than a year old than in those younger than this.

**Treatment** of erysipelas includes, first, the correction of the lesions which interfere with the normal vaso-motor control of the affected area. This usually stops the process of invasion.

Local treatment includes the application of ointments which give relief, and measures for preventing the extension of the process. Collodion applied to the normal skin around the inflamed area causes pressure upon the subcutaneous tissues, and this may prevent extension of the swelling.

Ichthyol preparations are often useful in relieving the local inflammation; 25% ichthyol in lard; 25% ichthyol in goose-grease and 10% to 25% ichthyol in glycerine are applications in common use.

The blisters should be opened with a sterilized needle before they become purulent, if this can be done. The pus must be drained from the purulent blebs, and the dressings applied under septic conditions.

The child should be isolated as in other infectious diseases. The infectious agent can be carried by fomites or a third person to others.

In hospitals the most urgent care is necessary to prevent transmission of the infection to other patients. The disease is rare in hospitals, but sporadic cases occasionally occur, even under the most faultless management.

During the progress of the disease the bowels must be kept freely active. Enemas of mildly alkaline solutions are best.

Children should be given water and fruit juices abundantly, but no solid food during the period of the fever. Babies may be kept on breast milk, but this should be somewhat diluted by giving a teaspoon or two of water just before nursing.

**The prognosis** is very good for recovery in children more than two years old.

### **Erysipelas of the Newly Born**

Erysipelas of the newly born is less common, as a result of infection of the stump of the cord, than is general sepsis. Erysipelas may follow infection of any abrasion, such as the prick of a pin. It probably does not result from infection during birth, but from a later infection. The incubation period is very short, from 15 to 60 hours.



Reddening and swelling of the affected part appears first, and later fever occurs, running from 102° F. to 106° F. or more. The baby begins to vomit severely, may have convulsions, falls into collapse and dies in almost every case within a week or ten days after the first symptoms. In the few cases in which speedy death does not occur the erysipelas usually affects various areas of the body in succession (erysipelas migrans). Many cutaneous abscesses develop later. Convalescence is prolonged and is broken by relapses and recurrences. General anasarca, bronchopneumonia and sepsis may occur at any time and these are often fatal.

**Treatment** is that of erysipelas in children, except that milder applications must be employed on account of the greater delicacy of the skin.

Bronchopneumonia must receive the treatment for that disease, but there is little hope for continued life when bronchopneumonia follows erysipelas.

## TETANUS

This is an acute infectious, non-contagious disease. The disease is diminishing in frequency with the diminishing numbers of horses.

**Etiology.** Age is an important factor. Tetanus neonatorum is very common and extremely fatal in certain localities, but it is not present among babies kept properly clean and with aseptic surroundings. Circumcision and vaccination may be followed by tetanus.

Wounds are almost essential to the entry of the bacillus. No doubt intestinal injuries offer opportunity of entrance in the cases supposed not to be associated with trauma. A deep, lacerated or contused wound gives the best opportunity for infection. Clean open wounds are rarely invaded by the bacillus tetani. Wounds contracted by explosions, such as are common on the Fourth of July, are often infected. Wounds contracted about stables or where horses are kept are often affected.

The bacillus is often found in the intestinal tract of certain herbivorous animals, is voided with the feces, and when this is used as a fertilizer the soil contains the bacilli. It is possible to isolate the bacillus from the dust in the streets in some towns, and from soil fertilized with stable manure in many countries. The horse has been intimately associated with the human race, and tetanus has, the diminished use of horses, become less common.

Cattle also harbor the bacillus of tetanus. Vaccine serum may carry the bacilli to children unless the most faultless technique is employed in preparing the serum.

The spores of the bacillus tetani are extremely tenacious of life and they are not injured by air, drying, sunlight or short periods of boiling. Disinfectants kill them only after exposure of some hours.

The bacilli grow in the wounds but do not penetrate into the blood or the deeper tissues. They produce an extremely virulent poison, and this passes into the nerves of the injured area, follows these nerves into the nervous system and thus produce the typical effects.

### **Types**

Tetanus neonatorum occurs soon after birth, and is due in most cases to carelessness in dressing the stump of the cord.

The incubation period varies from a few hours to two weeks, but usually the symptoms appear within the first week of life.

The onset is rapid, with crying, great restlessness and difficulty in nursing. The baby takes the nipple, pressing it between the jaws with marked contraction of the masseters. Soon it is very difficult to force the jaws apart. The eyes are closed, the face wrinkled, the lips protruded and there are occasionally spasmodic contractions of the muscles. The rigidity extends to the muscles of the neck, trunk and limbs. The spasms may be repeated at intervals of a few minutes, in severe cases, or only a few times each day, in milder cases. The spasms are precipitated by any sensory stimuli, such as a ray of light, a noise or a draft of cool air. In marked paroxysms the face becomes cyanosed, the eyes reddened and the corners of the mouth drawn outward, producing the "risus sardonicus." The body may be straightened and the back may be arched. The thumbs are clenched into the palms by the strongly flexed fingers, and the toes are flexed. Respiration is superficial and irregular, and breathing is difficult. The pulse is rapid and weak, and the cry very feeble. Slight clonic contractions may be associated with the tonic contractions.

Fever is moderate in the milder cases, and the temperature may remain normal. In severe cases the temperature may reach 107° F. or more before death. In very severe cases subnormal temperature and collapse may precede death.

Tetanus in older children produces about the same symptoms. The incubation period is short, rarely exceeding ten days. The child complains of chilliness, headache, feverishness and difficulty in opening the mouth. The stiffness of the muscles increases and the "risus sardonicus" appears. The stiffness spreads to the trunk and limb muscles and the spasms appear. The body is covered with perspiration during the paroxysm, and the pain is extremely intense. The body may be extended in a straight position (orthotonos) or drawn backward (opisthotonos) or drawn to one side (pleurothotonos) or doubled forward by the spasm of the abdominal muscles (emprosthotonos). In severe cases the incubation period is short, the spasms frequent and the fever high. In mild cases the incubation period is usually longer, the spasms and rigidity are limited to

certain areas (usually the face, jaw and neck) and the temperature is raised slightly or not at all.

**Differential diagnosis** is not usually difficult. The condition may simulate strychnine poisoning; in the latter there is relaxation between the spasms and trismus does not occur, or, at least, not until late in the disease. Tetany may resemble tetanus in very severe cases, but in tetany the muscles of the limbs are chiefly or alone affected; the trunk and face muscles are concerned very slightly or not at all. The electrical reactions of tetany are distinctive. Meningitis may be suggested by the opisthotonos or the orthotonos, but the "risus sardonius" is not ever present in meningitis.

**Treatment.** Prophylaxis is most important. The most absolute asepsis of everything which comes in contact with the newly born child prevents tetanus neonatorum. In regions where the disease occurs occasionally, any wound must be rigidly sterilized, even at the risk of prolonging repair.

When an infant in a hospital contracts tetanus, the infant must be isolated as in any other dangerous infectious disease, and the most rigid sterilization of every article with which the baby has been in contact be secured before it is taken into general use again.

When the onset of the symptoms occurs, the wound must be widely opened and thoroughly cleansed. This should remove the poison-forming bacilli. The poison remaining in the body must be eliminated. No further manipulations should be given.

The child should be kept in a cool, dark, quiet room, and no disturbance may be permitted. A pad of cotton may receive the discharges, and this removed easily. In very mild cases water can be taken, and this should be given in great abundance. No food should be given to children, but if they seem hungry, in mild cases, they may have thin gruel or diluted fruit juices.

Tetanus antitoxin was much commended during the war, for wounds received in the heavily manured fields of Belgium and France. Since the war, and especially in children's diseases, it has not been so greatly commended. If the serum is injected after the symptoms appear, it is probably too late. The dosage is not yet settled, but each preparation carries with it the dosage for that preparation. As an immunizing agent, antitetanic serum or tetanus antitoxin has received some approval.

Magnesium sulphate has been commended. Subcutaneous injections of a 25% solution, about one-half cubic centimeter, may be given three or four times each day. For very serious cases a much smaller dose may be injected into a vein or into the spinal canal. This method may induce respiratory paralysis and death.

If the spasms are very severe, sedative medicines may be used. The prognosis is extremely grave in any case, and even if life is

somewhat shortened, sedatives should be administered for the relief of the pain. Chloral is useful; 2 grains may be given a child two years old, each hour. Very severe spasms may require three grain doses each hour.

It may be necessary to administer this through a nasal tube, or through a colon tube. Eserin, 1/500 grain, may be given by hypodermic. Morphine may be given subcutaneously or by the colon tube.

**Prognosis.** Death follows tetanus in the newly born in more than half the cases. The mortality varies inversely as the incubation period. If the first symptoms appear before the baby is five days old, death is almost inevitable. If the baby is ten days old before the first symptoms appear, there is some hope for its recovery.

Tetanus occurring in childhood has also a very gloomy prognosis. If the incubation period is ten days or so, and if there is little or no fever, the child may recover. If the incubation period is less than five days, or if the fever is high, death is probably unavoidable. Respiratory symptoms increase the danger of speedy death.

## HYDROPHOBIA

(Rabies; Lyssa)

This is an acute infectious disease which occurs in certain animals and which may be transmitted to human beings. Children are more susceptible than adults, and are more often exposed. Dogs are most dangerous to the human race, though cats and rabbits have been bitten by rabid dogs, have contracted the disease and have been known to transmit the disease to humans.

Of all persons bitten by dogs unquestionably rabid, about one in five contracts the disease. If dogs are kept muzzled, there is no danger of hydrophobia from them. If the teeth pass through clothing, there is little danger of the infectious agent in the wound. If the wound is properly treated, the infectious agent is usually killed. The disease is not common, and with proper care of dogs it would not exist.

After a child has been bitten by a dog supposed to be rabid, the dog should be kept alive under observation until he develops the disease, when he should be killed and the brain examined for the Negri bodies. If the dog does not contract the disease after a week, he should be killed and the brain examined. If there are symptoms of rabies or if the Negri bodies are found in the brain, all dogs in the vicinity should be killed or should be kept in confinement under close observation for six months.

The infectious agent is a protozoan which is most abundant in the nerve cells of the hippocampus major in the dog, but which can be found in all parts of the nervous system. They are found scantily



in the saliva and other secretions, but are not found in the liver, spleen or kidneys. They form the "Negri bodies" which are diagnostic of the disease.

The infectious agent is transmitted with the bite of the animal, and passes to the central nervous system by way of the nerve trunks. They multiply freely, and the human body seems unable to resist their growth in any way.

Human beings affected by the disease do not become dangerous as the result of their attacks, and they almost invariably are anxious to avoid hurting their attendants as long as they are conscious.

The incubation period is long; the symptoms may appear within three weeks after the bite, or may be delayed for three months or longer. When the bite is upon the face the incubation period is shorter and the disease more serious; when the bite is upon the legs the incubation period is longer and the disease more mild.

The onset is gradual, with an appearance of increased inflammation about the wound, and nervous symptoms. Depression, irritability, insomnia and huskiness of the voice appear first. Any noise or bright light causes great annoyance, and the throat is inflamed. There is usually a slight fever.

These symptoms increase in severity until any sensory stimulation causes great suffering and severe spasms. The laryngeal spasms are especially severe and painful, and they cause a sense of suffocation which is distressing. Mania often is associated with the spasms; the patient may be perfectly sane during the intervals. The thought of swallowing or the sight of water causes sharp spasms, and this gives the disease its name. During this time the patient may have a fever to 103° F., or may have no fever at all. The spasms rarely persist for more than two or three days, and may terminate within the first day. The spasms then diminish and the patient becomes quiet and unconscious, the heart becomes weaker and death occurs without further discomfort.

**Treatment.** Prevention of the disease is easy. Dogs without owners should be killed promptly. Dogs should be registered and licensed by their owners, and the license fee should be sufficiently high to make it probable that all dogs are well cared for by their owners. All dogs not kept within the premises of their owners should be constantly muzzled; no dog should be allowed on the street without a muzzle. The muzzle can be made in such a way as to cause the dog no discomfort, and there is no reason for refusing to take this precaution.

When a child is bitten by an animal suspected to be rabid, the wound should be freely opened and bleeding encouraged. The surface should then be cauterized with pure carbolic acid or pure nitric acid, then washed freely with alcohol if carbolic acid has been used, or with a saturated solution of bicarbonate of soda if nitric acid has been used.

The Pasteur treatment may be employed if the facilities for giving it are convenient.

When the symptoms occur there is no treatment that is of much use, though the Pasteur treatment may be tried.

The child must be placed in a quiet, cool, dark room, and only the one or two persons required for his care be permitted in the room at any time. The throat may be de-sensitized with a solution of cocaine, and this may permit him to swallow. Abundant water may be given by the bowels, if he cannot swallow.

The spasms may be allayed by chloroform or morphine. These should be freely given, and the child kept comfortable.

The prognosis is hopeless, though every effort must be made to prolong life and to prevent suffering.

## LYSSOPHOBIA

(Pseudo-hydrophobia)

Nervous children bitten or attacked by a dog, and being aware of the danger of hydrophobia may present the symptoms which their fancy pictures.

The patient becomes depressed, asserts that he is "going mad" and suffers from paroxysms during which he grasps at his throat and becomes very much excited. He shrieks at the sight of water, is unable to swallow. He may attack others and bark like a dog. The latter occurrence definitely places the patient in the hysterical group. The treatment is that of hysteria, and the prognosis is excellent for recovery.

Bulbar paralysis, tetanus and occasionally atypical convulsions may resemble hydrophobia. The differential diagnosis is rarely difficult after the second day of the disease.

## TYPHOID FEVER

This is an acute infectious disease due to the bacillus typhosus and characterized by its slow progress, with diarrhea and other intestinal symptoms, a peculiar temperature curve and a variable eruption.

**Etiology.** Lesions of the eleventh thoracic to the third lumbar vertebrae are invariably present in any person who contracts typhoid fever, and these certainly predispose to the disease. A rigidity of the tissues of this part of the back is always present during the early stages of the disease, and this persists long after recovery if suitable treatment is not given. These abnormal structural conditions are responsible for abnormal circulatory and secretory condition of the gastrointestinal tract, they diminish the strength and the elasticity of the intestinal muscles and increase their extensibility. Nutrition is impaired by these conditions, and immunity to

all infectious agents is lowered. The infection of the gastrointestinal tract is especially facilitated by the lesions mentioned.

Fatigue, overwork, dietetic errors and wasting disease or any condition which diminishes vitality in general also predispose to typhoid.

The exciting cause of the disease, and the only cause of the particular symptoms of typhoid fever, is the bacillus typhosus of Eberth. This is abundantly present in the urine and feces of affected persons, and is transmitted chiefly by these excretions. The saliva, and blood also, contain the bacilli, but less abundantly.

Late childhood and early adult life are the ages most favored by this infection, though no age is exempt. Babies have been born dead from typhoid fever, and the bacillus typhosus has been recovered from the blood and the tissues. The newly born may be infected and suffer from the disease; the youngest baby with a typical case was three weeks old. Babies and little children are less frequently affected than are older children.

Transmission of the bacillus is usually due to the use of water polluted by feces and urine from typhoid fever patients. The bacilli seem to grow for long periods of time in the gall bladder, and from there they may be carried into the intestine and thus into the feces. The saliva carries the germs, but this does not seem to be a frequent carrier of the bacillus to other persons. Milk is a fairly common agent for the transmission. Utensils rinsed with unboiled water permit the bacteria to reach the milk placed in the utensil and thus the infection is spread. Vegetables irrigated with contaminated water may carry the bacillus if the vegetables are not cooked. Lettuce, celery, endive, young onions and radishes are commonly eaten raw, and thus the infection is spread. Strawberries also may carry the infectious agent. Unless it is known that polluted water is not used for irrigation, all these articles should be boiled thoroughly before they are eaten, during an epidemic of typhoid.

It is not yet known whether a mother can transmit the bacteria to her baby with her milk, but it is known that the agglutinating principle is thus transmitted, and it is also transmitted by the placenta to the fetus. The nurse who is not absolutely cleanly transmits the infectious agent from her patient to others by handling food utensils, cloths and other articles.

The bacillus is extremely tenacious of life, both within the body and outside of the body. While the most contagious period is probably during the greatest ulceration of the bowel, yet the feces and urine contain the bacilli for a long time, sometimes for years, after recovery. In other cases an individual who has never displayed symptoms of typhoid fever may carry the germs in the body, probably in the gall-bladder, for many years, throwing off the infectious

agent with the feces frequently. The dangers of spreading the disease by uncleanness is thus evident. The slightest contamination of the hands may permit the germs of the disease to reach food, eating utensils and other articles used by children, and thus the infection is spread.

Outside the body the bacillus lives through ordinary drying, ordinary cold, even to zero, and the passage of some years of time. Ordinary disinfectants, sunshine and a temperature of 140° F. for an hour kills them. They are unable to live in water in which any of the green algae live in considerable numbers.

### Pathology

The intestinal ulcers typical of the disease in adults and older children are not commonly found in young children. Fetal and congenital typhoid shows no intestinal ulcers at all. At about the age of two years the solitary and agminated follicles begin to be subject to the inflammation of typhoid fever, and when the intestines are examined in fatal cases they may show swelling and hyperemia. Rarely a slightly ulceration may appear. The spleen, mesenteric lymphatics and other lymphoid tissues are swollen and softened. The tendency to ulceration increases with age and at puberty the intestinal lesions are the same as those found during adult life.

Tissue degenerations, such as are common during adult life, are rarely found in children dead from typhoid fever.

**Symptoms.** The period of incubation varies, and it is difficult to determine it definitely. Certainly the onset has occurred within seven days after the drinking of doubtful water, later known to be polluted, and in other cases three weeks has intervened between the taking of probably polluted food or water and the onset of the first symptoms. The onset and the further course of the disease vary according to the age of the patient. The ordinary course of the disease is that of late childhood.

Typical case, in childhood. The symptoms are less severe than in adult life, the course is shorter and the nervous symptoms tend to shadow the comparatively light intestinal symptoms.

The onset. In young children the onset may be abrupt, with vomiting and, occasionally, convulsions. The symptoms of meningitis may be first noted, and an erroneous diagnosis be made for the first few days.

More commonly there is a period of some days, or even a week or more, during which the child is uncomfortable, eats little or no food, is thirsty and fretful, and complains of headache. A considerable amount of fever, sometimes to 103° F., may be present without arousing any suspicion of fever on the part of the other members of the family. Less commonly the gradual onset persists only for about two days before the characteristic rose-colored eruption appears.

The eruptive stage is usually free from nervous symptoms, except that there may be some apathy. The eruption may be limited to



the abdomen, or it may cover almost the entire body, in patches. The eruption appears about a week after the fever begins, appears in crops of about three-day intervals, and is followed by a branny desquamation, as in adults. Sudamina are common, as in adults, in older children, but are rare in babies and runabouts.

Vomiting is the most important digestive symptom, and this may be so severe as to cause death. Sore throat and tonsillitis are common in the early days of the disease. The tongue has a white coat, and occasionally the red triangle at the tip of the tongue and the red edges give the picture found in adults with typhoid. Either diarrhea or constipation may be present, or these may alternate. Epidemics differ to some extent in the proportion of diarrheas present. Occasionally the typical "pea-soup" stools appear. Involuntary evacuation is uncommon.

The spleen is always enlarged to some extent, and it may be very greatly enlarged. It does not return to its normal size until the child recovers from the disease.

The temperature curve is characteristic in children, as it is in adults, in typical cases. In other cases it presents a very irregular curve, without the step-like character. The evening rise is higher and the morning fall less marked each day for about a week, maintaining about the same daily variations. The temperature then remains at about the same level, still with evening and morning changes, for about a week. The highest point rarely exceeds 104° F. in typical cases. Children endure high temperatures better than do adults, especially in typhoid fever, and even hyperpyrexia can be endured without serious symptoms. The fever may terminate by lysis, as in adults, or occasionally by crisis. Irregular periods of fever may appear at intervals during convalescence, and these occasionally reappear for several months after the child seems perfectly well in other respects.

The pulse is slower than the fever suggests, and dicrotic pulse is common. The blood-pressure is low.

Cough is common and rales are usually perceptible through the lungs. Epistaxis is less common in children than in adults. Emaciation is usually marked.

Nervous symptoms are less marked than in adults, but may shadow the digestive symptoms, which are greatly diminished in children. Headache, pains in the joints, tenderness of the abdomen, muscular rigidity and diminished reflexes are common symptoms. Delirium, coma, stupor, subsultus and coma vigil are less common in children than in adults. Apathy is common, though many children remain bright and cheerful throughout the course of the disease.

**The blood** shows no leukocytosis, and occasionally a definite leukopenia. Large hyaline cells and splenocytes are actually and relatively increased. Small lymphocytes are relatively increased, but are absolutely normal. Eosinophiles are reduced. Children normally present a higher leukocyte count with a relatively high lymphocyte count, and this must be considered in interpreting blood findings. Children react to pyogenic infections with rather marked leukocytosis, and in complicated cases a high leukocyte count may be present even though there is definite typhoid.

The typhoid bacilli can sometimes be found in the blood before a positive Widal reaction is found.

The Widal reaction is typical when it is positive; negative Widal does not eliminate typhoid fever. The serum of the blood of a patient with typhoid fever causes a clumping of fresh cultures of typhoid bacilli in about 95% of all typhoid cases. The reaction is not often positive until about the end of the first week and it may not be positive until convalescence. It may be negative through the course of the disease, but become positive during a relapse. It may be positive for years after an attack of typhoid, or the blood serum may give negative findings within a few months after recovery.

**The urine** gives a positive diazo reaction, and the usual findings in fevers generally.

### Types of Typhoid Fever

**Fetal** or congenital cases show certain peculiarities. In fetal cases the child is still-born; in congenital cases continued life is possible. The pregnant woman aborts in about three-fourths of all cases. The fetus shows no gross evidences of the disease, but the bacilli can be recovered from the blood and the tissues.

The baby born with typhoid fever may live for a very short time, may live several weeks, or, very rarely, may recover. The symptoms are characteristic, including fever, roseola, enlarged spleen and vomiting. Convulsions, coughing, jaundice, intestinal hemorrhages and purpura occasionally are found in these babies. The Widal reaction is positive in babies whose mothers have had typhoid fever during pregnancy, so this is not diagnostic of typhoid in the baby. It is rare that such a child lives more than a week or ten days. No intestinal ulcers are found.

**Infantile** typhoid fever occurs during the first two years of life. Diagnosis may be impossible unless the typical eruption occurs or a positive Widal is given by the blood serum. The temperature is high and irregular. Diarrhea, tympanites, vomiting and prostration suggest ileocolitis. No intestinal ulcers are present. Bronchitis and cough are common. The baby is more apt to be fretful and restless than apathetic. The pulse is rapid, and nervous symptoms are com-

mon. Convalescence may be prolonged but recovery is to be expected.

**Early childhood** typhoid occurs before the age of six years, and after two years. Some ulceration of the intestines may occur. The temperature curve resembles that of typhoid fever, and diagnosis is usually possible even before the eruption or the positive Widal. The disease is usually short and very mild, and recovery is uneventful.

**Late childhood.** After the age of ten years, the disease resembles the typhoid fever of adults. Diarrhea is troublesome; there is danger of perforation, and the typhoid state may develop.

**Abortive** typhoid is common in osteopathic practice, and it may occur under any circumstances. The onset may be typical or severe, but the fever runs its course rapidly and terminates within a week or ten days. Abortive cases are much more common among children than adults. Definite diagnosis may be difficult. The Widal reaction may not appear at all, and the eruption is often atypical or absent. When a positive Widal follows an aborted case, the diagnosis is fairly well proved.

**Mild forms** also are common during childhood, and especially common in osteopathic practice. Slight headache and slight apathy may be the only symptoms. Continued feverishness, the appearance of a few rose-colored spots and a positive Widal determine the diagnosis.

**Nervous type.** This is not a rare type during early childhood. Repeated convulsions, grinding of the teeth, rigidity of the neck suggest meningitis. The typical typhoid temperature and eruption may develop later. In older children the nervous symptoms may follow the first or second week of typhoid. Meningismus is a fairly common state in severe attacks of typhoid.

### Complications

These are rare in children. Bronchitis, pneumonia, hypostatic congestion and laryngitis are the most common of those which do occur. Ulcerative laryngitis may require intubation or tracheotomy. Other sequelae, so common in adult typhoid, are very rare in children.

Noma, diarrhea, intestinal hemorrhage, pericarditis, endocarditis, intestinal perforation, stomatitis, fecal impaction, peritonitis, aphasia, mental deterioration, chorea, otitis, nephritis, bedsores and various suppurative processes may occur, but all are rare. Urticaria and various atypical rashes may follow the typhoid eruption.

Typhoid predisposes to almost any of the other acute infectious diseases, and these tend to be more severe when they follow typhoid.

### Treatment

Prophylaxis is important. Isolation is not necessary, but the child is more comfortable in a quiet room. The urine, feces, all clothing and bedding must be very thoroughly sterilized as already directed. The nurse must wash the hands with green soap and rinse them thoroughly after she handles the linen or the excretions or attends to the child.

The source of the infection should be found as soon as possible, and appropriate measures taken to correct the unsanitary condition. Until the source of the infection is found all water and milk, and all vegetables, should be thoroughly cooked before they are eaten.

Vaccination against typhoid has not proved useful.

Treatment includes the relief of the spinal rigidity always present in typhoid cases, the correction of all spinal lesions found on examination, and daily examinations with such further corrective work as may be indicated at each examination. If the temperature exceeds 103° F. measures for its relief may be given. Inhibition of the suboccipital triangles, and of the areas found most tensely contracted in the splanchnic region diminishes the fever in all cases. If the fever rises during the absence of the osteopathic physician, the nurse should be told to use some form of hydrotherapy. The sponge bath is best. If the child objects to sponging, a tub bath is better. The water should be at a temperature of about 95° F., and be lowered gradually to about 85° F. He may remain in the tub for ten minutes, more or less, according to the reaction. The head may be kept cool by the application of a cloth wrung from cooler water. The child should be rubbed during the stay in the bath, and when he is taken up he should be wrapped in a sheet with a blanket over it.

This cool bath may cause cyanosis; the child should be immediately removed and wrapped in a warm blanket; stimulating treatment is then indicated until the circulation becomes normal. The warm bath, 95 to 100° F., may lower the fever and give much relief. No bathing should be given to a child who struggles and cries out against it. It is necessary to avoid exciting the child in giving any kind of hydrotherapeutic measures, or the results are harmful and tend to higher fever, greater nervousness and greater prostration. Cold baths and cold packs are not to be given to children.

Ice bags, covered with flannel or bath towels, may be placed around the child when the fever rises and bathing is not feasible. They should not cause any perceptible chilliness, but lower the temperature gradually. Fresh clothing and bed linen give much relief when there is persistent feverishness.

When the temperature persists beyond the second week and seems very obstinate, without recognizable cause, the child may be



allowed to sit up in a chair or to have a guest or a new toy. This often results in more normal metabolism and relief of the fever.

Abdominal pain can be relieved by the application of warm cloths or a hot water bottle or electric pad. Lesions, usually of the second lumbar, with tension of the adjacent tissues, are found at the next examination. The correction of these usually causes the relief of the pain to be permanent.

Direct treatment over the abdomen, the spleen and the liver are frequently indicated by the conditions as found on examination. The lower ribs must receive such treatment as is required. The inflamed condition of the bowels must be kept in mind, and any direct treatment which is given must be extremely delicate and careful.

Headache and delirium are treated by correcting neck lesions and relieving the tension which is always present, in these cases, in the cervical region and around the thoracic inlet.

Constipation and diarrhea are best treated by the use of enemas. For constipation, a warm enema with one teaspoon of soda to each quart can be used at need. For diarrhea, a slow enema of warm or cool water gives a comfortable feeling of cleanliness and usually relieves the diarrhea for some hours.

**Diet.** The food varies according to the age of the child. Babies who are breast-fed should have the milk somewhat diluted by giving the baby a teaspoonful of water just before nursing. Babies on artificial food, at the age of six months or more, should have the food slightly diluted, and they should receive also one teaspoonful of orange juice in five times as much water two or three times each day. Prune juice may be given in the same way, but not upon the day in which orange juice is given.

Older children should have the diet used for adults with typhoid fever. A liquid diet is imperative, and any food which forms hard residue is contraindicated. Milk is the classical food for patients with typhoid fever, but this has been avoided recently. If the patient digests the milk well, and if no hard curds are formed from it, milk can be given freely. Whey, buttermilk, cream diluted with three times its measure of hot water, and junket are often taken and digested well when sweet milk is not well handled. Broths made from chicken, mutton or beef are given; they are not especially nutritious. Albumin water, made by mixing egg whites with water and then straining, is often given and is usually well handled. The egg white does not mix well with distilled water; if the water used is distilled a very small amount of salt should be added to the water.

An exclusive carbohydrate diet is sometimes used. This diet list includes several articles. Thin slices of bread which have been toasted brown all through, eaten very slowly, are given at one

meal; toasted crackers at another meal, and very finely mashed baked potato, with a small amount of salt and milk to taste, at another. No butter or proteid foods, except a small amount of milk, is permitted.

In any diet for typhoid fever, it is very important that no modifications be made. If necessary the diet may be changed, but it is not good to allow more than one article of food to be taken at any meal, and if the milk diet is given, no carbohydrates are allowed; if meat broths are given, they should be given alone. Unless there is some need, the diet first planned should be given throughout the entire course of the disease.

In all cases, a free drinking of water is essential to speedy recovery. A small amount of lemon juice, grapefruit juice or orange juice should be given each day. Other fruit juices, especially grape juice and blackberry juice, diluted to taste with water, are usually well taken and nutritious. They may be either hot or cold.

Weak tea, hot or cold, without milk or cream, is refreshing if the child seems weak. A small amount of sugar may be added to taste.

**Intestinal perforation** requires immediate operation. The pain may be relieved, temporarily, by hot applications over the abdomen. The child must be kept absolutely quiet until time for the operation.

### Prognosis

Fetal typhoid is always fatal and congenital typhoid almost always is fatal. In infancy about one-third of the cases are fatal. After the age of 2 years the disease seems much less dangerous, and almost every child recovers from typhoid. After the age of 13 years, the mortality is about that of adult life.

With early and thorough osteopathic treatment, the prognosis is much better than is indicated by the usual statistics.

### PARATYPHOID FEVER

This disease resembles ordinary typhoid fever only in that it is due to the bacillus paratyphosus A or B, and the blood serum agglutinates these bacilli but does not agglutinate the bacilli of typhoid fever. It seems to be rather less often fatal than true typhoid fever. It is not common in childhood, but has been found among little babies as well as older children.

The treatment of the disease and its complications are the same as in typhoid.

### TYPHUS FEVER

This disease is scarcely found among children. Its cause, progress and treatment do not differ from the disease as found in adults.

## CHAPTER LXXXVIII

### ACUTE FEBRILE ERUPTIVE CONTAGIOUS DISEASES

The acute exanthems with fever, due to some infectious agent not yet well known, include scarlet fever, the "fourth disease", measles, rubella, variola, varicella and a few others less well known.

Predisposing causes are the same for these diseases. Babies under six months old are immune if the mother is immune. They nearly always share the disease if she contracts the disease. The baby may be born with the rash if the mother has the disease at about the time of labor, or it may be born with scars resulting from the eruption if the mother had the disease some weeks or months before her confinement.

The general physical condition of the child seems to have little influence in immunity to these diseases. Gastrointestinal disorders, especially over-eating, constipation or diarrhea seem to lower immunity, but so many children who are exposed escape, even from measles, that the relation between physical condition and immunity seems difficult. Each of these diseases confers almost absolute immunity for itself. Second or even third attacks occur, though very rarely. These may represent errors in diagnosis in some cases.

Any one infectious disease seems to lower immunity to other infections, and passive immunity attained for one disease also seems to lower immunity to other infections.

Reports from osteopathic physicians who have investigated the question seem to show that rigidity or other lesions of the fourth to the tenth thoracic vertebrae lower immunity to all diseases.

The specific infectious agents have not yet been isolated.

#### VARICELLA

(Chicken-pox)

This acute infectious disease is characterized by an eruption of vesicles upon the skin.

**Etiology.** The infectious agent is unknown. The disease occurs in epidemics and as isolated cases. It is often associated with smallpox in epidemics. An association with herpes zoster is inferred from the characteristics of the eruption. The incubation period is ten to fifteen days.

Varicella is not variola, and it has no apparent relation to variola. Neither disease confers immunity for the other.

Dr. Marjorie M. Johnson reports cases in which herpes zoster alternated with varicella in two families.

**Symptoms** are distinctive. The onset is with chilliness or fever, or with fever alone. Vomiting, pain in the back and legs and some malaise precede the eruption by a few hours. Rarely convulsions occur with the onset.

The eruption usually first appears upon the back or the chest, but occasionally the face is first affected. Occasionally a scarlatini-form rash precedes the eruption. First red papules appear; these fill up with a pale, clear liquid, forming hemispherical vesicles. Within a few hours the contents of the vesicles become turbid. The vesicles are always discrete. Umbilication of the vesicles is rare, but may occur, and the vesicles may be flattened. They have a more superficial appearance than do the vesicles in smallpox. The neighboring skin remains normal, or almost normal. The eruption occurs in crops for three or four days. The poeks may be scanty, or may number hundreds.

During the second or third day the contents of the vesicles are distinctly purulent. During the next day or so the vesicles dry up, leaving scabs of dark brownish color. These fall off, leaving slight or no scarring.

The mucous membrane of the mouth may show the eruption.

When varicella appears in a child nearing puberty, the disease may assume the more serious adult form. The fever is high, the constitutional symptoms severe and the eruption abundant, so that an erroneous diagnosis of variola may be made.

The eruption usually disappears within a week, and all symptoms pass away, in most cases, leaving no evil after effects.

**Complications** are rare, but may be severe. Variations occur. The vesicles may be very large, and may develop into bullae. An erroneous diagnosis of pemphigus or ecthyma may be made probable by the size and character of these bullae.

Hemorrhagic varicella (black chicken-pox) is associated with ecchymotic hemorrhage into the skin lesions and into the mucous membrane.

Nephritis, infantile hemiplegia and other sequelae are rare.

When the skin is extensively involved death may result.

**Treatment.** In addition to the treatment for diseases of this type, which need not be so rigorously administered, it is necessary to prevent the child from scratching the face. Scars may result from the scratching, and secondary infection may be promoted by the scratching.

**The prognosis** is fair for complete recovery within ten days or two weeks.



## VARIOLA

(Smallpox)

This is an acute infectious eruptive disease characterized by the progressive changes of the papules into vesicles, pustules and crusts.

**Etiology.** Personal and family immunity has been recorded. In any epidemic comparatively few of those exposed contract the disease; this is not always due to vaccination. The disease affects all ages, but little children are more seriously affected. Babies usually die if they contract smallpox. If the mother has smallpox the baby may be born with the disease. These cases less often die than do babies born without the disease, but who contract it very soon, as is the case when a baby is born in a smallpox hospital.

Aboriginal races contract the disease with celerity, and they usually die from its effects.

Epidemics vary in severity and in contagiousness. Isolated cases frequently are found. Mild cases may be mistaken for chicken-pox. Other mild epidemics may be unrecognized and be called by some other name. "Cuban itch", "Philippine itch" and other names have been applied to such epidemics. Very often an entire epidemic is characterized by such mild symptoms that recognition and isolation become very difficult.

The infectious agent is not definitely determined. A small protozoon, the *cytoryctes variolae* has been described, and has been considered the probable agent. The organism has a double cycle and passes into a cytoplasmic stage. These organisms are found in the deeper layers of the epithelial cells of the skin. The incubation period is about twelve days, sometimes eight, and rarely sixteen days.

The disease is extremely infectious. The scales of the desquamation and the nasal secretions contain the virus in great amounts. Fomites and third persons may carry the disease, and the virus may remain for a long time in clothing, bedding or furniture. During an epidemic of average severity a person suffering slightly from the disease may give it to another person who may suffer severely. During epidemics which are mild, nearly all cases are mild; during severe epidemics, nearly all cases are severe.

**Tissue changes** include nearly all the organs of the body. The skin, mouth, pharynx, rectum and occasionally the esophagus and stomach show the characteristic eruption. Laryngeal edema is fairly common. Ulcerative erosions upon the larynx and trachea are common; these may be fatal. Cloudy swelling and fatty degeneration are found in the heart, kidneys, liver and spleen very commonly, and in other organs less frequently.

In hemorrhagic small-pox extravasations of blood may be found in the organs named and in the skin, and also in the nerve sheaths and the central nervous system.

### Types of Small-pox .

**Variola vera**, the usual form, may be either discrete or confluent.

A chill initiates the onset of the disease in older children, as in adults. Frequently convulsions usher in the stage of invasion in children. Chills may be several times repeated during the first day. Fever reaches 103° F. or more. With the fever severe pains in the limbs, back and head appear. This very severe pain serves to differentiate small-pox from other acute infectious diseases. Vomiting is constant and may be severe and persistent. The face is flushed, the skin usually dry, the eyes very bright and the mind clear during this stage. The chills, fevers, convulsions and the aching may persist for three to five days.

Initial rashes vary. Diffuse or scarlatinai rashes and macular or measles rashes may be associated with petechial eruptions and these may invade almost or quite all of the body. Most commonly only the lower abdominal, inner thigh and lateral thoracic areas are invaded by the first rashes. The scarlatiniform may present a marked resemblance to that of scarlet fever; the measles rash may greatly resemble the rash of measles. Urticaria occasionally appears as an initial rash, or it may be associated with either of the other types. In about 80% of the cases no initial rash appears.

The characteristic eruption may be discrete. This appears on about the fourth day of the disease. Macules appear on the forehead first, in most cases, and on the anterior surfaces of the wrists. They may be preceded by erythema, or may arise from apparently normal skin. They are then found scattered over the body within a few hours. At first the spots are brilliant red, disappear on pressure, and are two or three millimeters in diameter. The fever and pains diminish and the patient becomes quite comfortable when the eruption appears. The next day the macules become papules, and within another day these become filled with a clear liquid, becoming vesicles. Each vesicle is elevated, circular, has a flat summit, or the summit is umbilicated. At about the eighth day the vesicle becomes rounded on top and the contents become turbid. The skin around the papule becomes reddened and edematous. The vesicles are then frankly pustules. With this change, the fever rises and the symptoms of the onset recur, sometimes in more severe, sometimes in less severe form. The face becomes swollen and the eyes may be closed by the swelling. There are variable pains and the fever may vary. This state persists for about a day. Then the pustules begin to dry, the fever diminishes, the crusts form and by the fifteenth day recovery is apparently imminent.

The order in which the areas are invaded is characteristic. The upper part of the back is usually abundantly affected. The lower part of the back, the lower abdomen, groins and legs may remain almost free from the eruption. Vesicles may form in the mouth

and throat; the voice may be lost for a few days, from the involvement of the laryngeal tissues.

The odor of the small-pox patient is characteristic, and this may be useful in diagnosis, in doubtful cases.

The confluent form is more severe throughout the entire course of the disease. The papules may be discrete at first, but they multiply rapidly and soon become thickly placed. The symptoms diminish with the initial rash, but not to so great an extent as in the milder, discrete form. With the formation of pustules, about the eighth day of the illness, the skin swells greatly, the hyperemia is extreme, and the pustules become confluent over the face and hands. The pustules remain discrete over the body. The skin presents the picture of a wide abscess. The fever may reach 105° F. or more. The pulse goes to 120, rarely above that. There may be delirium, convulsions or great restlessness.

The outlook depends chiefly upon the manner in which the face is affected; a scanty eruption on the face suggests hopefulness, even though the disease seems extremely severe. If the face is thickly covered the outlook is gloomy. In fatal cases there is prostration, usually diarrhea, great weakness, peculiar twitchings and writhings of the muscles and picking with the fingers. Death occurs on the tenth to the fourteenth day. In other cases, which may not seem less severe, desiccation begins on the eleventh or thirteenth day. The pustules dry and their contents form crusts, the fever diminishes and the symptoms grow less severe. The crusts adhere more strongly in the confluent than in the discrete form and it may be four or more weeks before the crusts have all fallen.

**Hemorrhagic** small-pox is a very malignant type. The incubation period is very short in these cases. The onset is severe and abrupt. In purpura variolosa (black small-pox) the initial rash is purpuric, first petechial and then ecchymotic. The skin may seem completely a purplish color. Hemorrhages from the mucous membranes may be found; bloody urine is rather common. Death usually prevents the occurrence of the typical eruption, or the child may live until a few discrete papules appear. The mind usually remains clear, but a low delirium or a typhoid state may be present.

In another type of hemorrhagic small-pox the earlier stages of the disease are rather severe, but present no marked variation from the usual type of small-pox. When the pustules appear a hemorrhagic condition occurs; bleeding occurs into and around the pustules, and the mucous membranes become hemorrhagic. Recovery is rare.

**Varioloid** (mild small-pox; modified small-pox; variola sine eruptione). This type occurs in persons who may or may not have been vaccinated, and this type includes all, or nearly all, of the cases in certain epidemics.

Before the prevalence of vaccination this was called "nurses small-pox" or "mother's small-pox". This form resembles the ordinary type except that all symptoms are less severe, and pustules are very rare. The prodromal rash is usually present and may be more marked than in other cases of the same epidemic. The fever falls after this rash, and the suppurative fever rarely occurs. Scarring is rare.

### Complications and Sequelae

Relapse, that is, recrudescence of the symptoms and return of the eruption before recovery, is rare. Recurrence hardly ever occurs, but cases of undoubted recurrence are recorded. The second attack is usually extremely mild. Life-long immunity is almost always conferred by an attack of small-pox.

Respiratory complications are rather common. Laryngitis and bronchitis are almost always present in severe cases. Edema of the glottis may cause sudden death in patients apparently not very ill. Bronchopneumonia and purulent pleuritis are usually present in fatal cases.

Otitis is a rather common sequel. The eyes are not often affected in any way.

Cardiac complications are rare. Nephritis rarely is associated with small-pox, though febrile albuminuria is almost invariable. Suppurative inflammations of the lymph nodes, multiple abscesses of the skin, erysipelas and encephalitis and myelitis may follow severe attacks.

Other infectious diseases do not often co-exist with small-pox.

**Diagnosis** is usually easy. The primary eruption may be mistaken for measles or scarlet fever. The eruption following vaccination may resemble small-pox itself. Severe cases of chicken-pox present great resemblance to small-pox. During an epidemic of both diseases at the same time, it may be impossible to distinguish between atypical cases of the two diseases. Pustular syphiloderm resembles small-pox, but the history should differentiate the two diseases. Cases of poison ivy have been called small-pox; the history should make clear the diagnosis in such cases.

**Treatment.** Isolation and quarantine must be rigidly enforced, according to the general directions already given. In some cities the enforced removal of the patient to the city hospital is legal.

The general treatment for the acute exanthemata is indicated. The symptoms must receive attention as they appear. Relaxation of contracted muscles and correction of lesions as found gives marked relief and may prevent further discomfort in many cases. Complications are avoided in most cases, if the treatment outlined is given persistently. Even if some slight further injury to the skin seems unavoidable, the work which is indicated should be done.



In small-pox the elimination of the actinic rays is said to diminish the tendency of scarring. This is secured by the use of yellow or red shades for the light. Darkness in the room is not necessary.

Crusts must be kept softened by the use of oily dressings, vaseline or ointments, by frequent bathing, and by the application of the soft dressings wet in any mild aseptic solution.

Cleansing the eyes several times each day with boric acid solution or some other mild, aseptic solution gives great relief.

Masks may be used to hold the dressings in place and to prevent scratching. They usually give relief in those cases in which they are required.

In severe epidemics occurring before the use of sanitary provisions, the mortality has reached almost to 50% of all those suffering from the disease. In those days only the severe type was recognized as being small-pox; mild cases were not included in the statistics. Since mild cases have been recognized as small-pox, and since sanitary conditions of living have become common and since quarantine has become customary, the mortality has been considerably lowered. In mild epidemics very few deaths occur. In babies less than a year old, about one-third die, most commonly from the associated bronchopneumonia.

No evil after-effects are to be anticipated, when once recovery is definitely begun. Convalescence is not prolonged, and by the time the quarantine can be removed the child is usually in normal health.

## VACCINIA

(Vaccination)

Vaccination is the inoculation of the human body with the virus of cow-pox, in the hope of diminishing the symptoms of small-pox which may be contracted later, or even of preventing small-pox altogether.

Cow-pox is an eruptive disease commonly found upon the udders of cows; occasionally it is found among horses also.

The infectious agent is not known. Cytoryctes, resembling those described for small-pox, have been found. The etiological value of these organisms has not yet been determined.

Vaccination is now performed by the use of glycerinated preparations of the cow-pox virus, prepared in as aseptic a manner as is possible.

Vaccination is advised for infants three or four months old, and at intervals from that time during life. Vaccination during the first month of life is advised under certain circumstances.

Technique is simple. The skin of the arm or leg is sterilized and then is scarified very superficially by a sterile needle. The infected lymph is then gently rubbed into the wound, this allowed to dry,

and the area is then covered with sterile dressings. Outfits are sold which include the needle or pointed glass with which the scarring is done. Directions are included with each type of outfit. The mother must be directed to avoid wetting the dressing; the infant must not have a tub bath until the vaccination sore is completely healed.

Quarantine is not indicated.

The lesion thus produced is practically identical with the lesions of small-pox. On the third to the fifth day after vaccination one or more macules appear at the site. These develop into papules, vesicles and pustules, as is the case in small-pox accidentally contracted. Umbilication is noted, as in small-pox. Desiccation begins on about the tenth day, but the crust rarely drops off for three weeks or more after vaccination. During the development of the eruption fever may reach 102° F. in ordinary cases, or 104° F. or more in severe cases. Vomiting, restlessness, malaise, anorexia and swelling and painfulness of the axillary or the inguinal lymph nodes are usually present in ordinary cases of vaccination.

Unsuccessful vaccination frequently occurs. The wounds heal without evidence of infection, in some cases. In other cases a purulent wound develops, and this may become a deep-seated abscess. This does not protect against small-pox, but causes great suffering. Diffuse cellulitis or gangrene may follow this accident.

Spurious vaccination occurs, most commonly in persons not vaccinated before. At the site of the wound a vesicle develops which produces pus and crusts rapidly, often within the first week. Itching is very severe. In other cases only a vesicle or papule develops. In still other cases a mass of granulation tissue, "raspberry excrescence" develops.

Generalized vaccinia of the spontaneous type is not very common. The skin lesions resemble those of varioloid. They appear in crops and are sprinkled over the body, as in discrete small-pox. Constitutional symptoms may be very severe.

Generalized vaccinia by auto-inoculation is fairly common. By scratching the wound or as the result of a co-existing eczema or other eruption the virus reaches other parts of the body. The mouth, throat and nose are affected, as in small-pox. Constitutional symptoms may be very severe, and the condition is often fatal.

Urticaria, erythema, eczema, impetigo, lichen, furunculosis, miliaria, pemphigus, ecthyma and other skin diseases may be associated with or follow vaccination. The vaccinal lesion and the surrounding skin may become hemorrhagic.

General sepsis, erysipelas and tetanus may be given to the child by vaccination. Hodgkin's disease has been known to follow vaccination in several cases.

When human lymph was employed for vaccination, there were cases of tuberculosis and syphilis following vaccination. The use of bovine lymph prevents inoculation with syphilis. If the cows used are known to be healthy, tuberculosis and other diseases are not thus transmitted.

The importance of vaccination as a preventive of small-pox is widely accepted, yet there is little evidence of the truth of the statements made. With vaccination, sanitary conditions in general have always been accepted, quarantine has been enforced and thus all acute infectious diseases have diminished in severity and in frequency. Scarlet fever and measles, for which no vaccination has been advised, are diminishing in severity and in frequency fully as rapidly as is the case in small-pox epidemics.

The duration of this protective power, such as it may be, is temporary. From five to seven years is the usual duration attributed to vaccination during childhood. Vaccination is compelled for those entering public schools in some states. When vaccination does not "take" it is usually inferred that the child is immune also to small-pox. Repeated vaccination is advised, in such cases, until vaccination is successfully performed.

**Imitations** of vaccination are occasionally found. The vaccination wound may be touched with nitric or other sharp acids and a fairly typical scar results therefrom. If the case is under observation during the weeks after vaccination this deception is unsuccessful. The resulting scar is not always distinguishable from that of vaccination. Other deceptions are usually recognized rather easily.

## SCARLET FEVER

(Scarlatina)

This is an acute febrile exanthematous disease, self-limited, characterized by variable angina and other symptoms. Scarlet fever varies greatly in different epidemics, sometimes being extremely mild, and in others terribly malignant. Generally speaking, there is a definite tendency to diminishing severity. It is found among nearly all races and nearly all countries of the world. It is said that the native races of India are immune.

Cases occurring in autumn and winter are apt to be especially severe and to spread rather widely. (This is also the time for inflammatory conditions of the respiratory tract). With May and June the numbers of cases diminishes, probably on account of the closing of the schools.

**Etiology.** Age is an important factor. About 90% of children with scarlet fever are less than ten years old. Family susceptibility is occasionally found, when almost every child of the family dies from the disease.

The infectious agent has not yet been isolated. Some strain of streptococcus is probably responsible for the disease. This agent is extremely resistant to dryness, heat and time; and it clings for a long time to fomites without losing its virulence.

The location in the body which harbors the germ is not definitely known, but probably the nasal secretions carry the infection. The disease is very infectious during the stage of exfoliation, and it seems probable that the scales of the skin are affected by the infectious secretions of the body, perhaps by the sweat, and certainly by the nasal secretions.

Milk which has been in contact with infected persons may carry the germ. It must be remembered that there is a disease of the udders of cows which may be transmitted by the milk and cause a feverish, scarletiform eruptive disease.

Surgical scarlatina is an eruption which sometimes follows surgical operations. It is due to some streptococcus infection, shows slight or no angina, and affects adults more often than children, since adults are more frequently operated.

**Tissue changes** are not marked. The eruption disappears at death, unless hemorrhages have been associated with it. There are many streptococci in the lymph nodes, the glands, the nasal and pharyngeal membranes and the foci of supuration. The lymphoid tissue shows hyperplasia, as in other inflammatory states, and focal necroses are common. Endocarditis and pericarditis, nephritis, hepatitis and pharyngitis are usually found at autopsy. Pulmonary and cerebrospinal lesions are rare in scarlet fever.

### Progress of the Disease

The incubation period is short, from one to seven days, or from ten to fourteen days, in different epidemics.

The onset is abrupt. Occasionally a day of malaise is noted. Vomiting, high fever and sore throat are the most common initial symptoms. The fever rises rapidly to about 104° F. or more. The skin is extremely dry and hot. The throat is dry and may be sore, and the tongue is heavily furred.

About a day after the onset the rash appears, first scattered red points over the chest and neck, then by increase and spreading of these points the skin is completely covered. The rash is of a peculiarly brilliant scarlet tint, quite unlike that of other diseases. The color disappears on pressure but immediately recurs when the pressure is removed. Fine punctate hemorrhages occasionally occur, and these do not disappear on pressure and they persists after death. Any marked pressure, such as that of the cuff of a sphygmomanometer, causes them.

The rash may not entirely cover the body, but may remain in irregular patches separated by normal skin. These cases are neither more nor less serious, nor are they more apt to be followed by evil after results.



Transverse lines at the bend of the elbow are commonly found. Minute papules are not common, but may appear. The affected skin grows rougher each day, finally resembling "goose-flesh". The color becomes duller and darker in hue, sometimes being quite bluish after two days or more. Sudaminal vesicles appear at the height of the rash, and the clear fluid which fills them may become turbid; rarely purulent. These tiny yellowish vesicles upon the bright red skin of almost or quite the entire body has the name "*scarlatina miliaris*". The punctate eruption in the groin, armpits and roof of the mouth are pathognomonic.

The face may escape the eruption. Swelling and edema of the face may be very uncomfortable. The mucous membranes of the mouth and cheeks, the tonsils and the edge of the tongue are all very brilliantly red. The central areas of the tongue are furred, usually whitely, with the swollen red papillae emerging from the fur. This gives the "strawberry tongue" characteristic of the disease. The fur disappears later, leaving the red papillae very prominent (raspberry tongue). The breath has a peculiar sweetish, heavy odor.

The pharyngeal symptoms may be severe. Follicular tonsillitis may be associated with swelling and infiltration with round cells of all the tissues of the pharyngeal region. The tissues of the neck may be badly swollen and the neck be stiff and painful.

In serious cases the temperature often exceeds 106° F., and just before death it may reach 109° F.

The pulse varies, usually it exceeds 120, and may reach 200. Respiration increases with the fever. Leukocytosis is variable, from 15,000 to 50,000, with about 85% neutrophilic. The eosinophiles disappear almost or quite completely, as in streptococcus infections generally. They reappear and increase in numbers during convalescence until the normal proportions are present. Peculiar "inclusion bodies" are found within the leukocytes and in the glands of endothelial cells of the body. Their nature is not known. They are occasionally found in other high fevers.

Desquamation follows the rash. As the red color disappears and the sudamina dry up, the skin begins to desquamate, first upon the chest, and following the order in which the infection first appeared. When the eruption has been profound there may be quite large flakes thrown off, but usually the desquamated scales are rather small and branny. Rarely the hair and the nails have been shed. The process is slow, usually occupying fifteen and often forty days, rarely more than this.

### Types of Scarlet Fever

Mild scarlet fever (abortive scarlet fever; *scarlatina sine eruptione*) is a form characterized by feverishness, sore throat and "strawberry" tongue. Rash may not be perceptible, but desqua-

mation is usually recognizable. Nephritis may follow, but is rarely severe. This form is dangerous, since such children carry and transmit the infection. They are, however, more apt to transmit a mild than a severe type of the disease. Immunity is conferred by the mild form.

**Hemorrhagic** scarlet fever is characterized by the profuseness of the hemorrhages into the skin, with hematuria and epistaxis. The very tiny hemorrhagic points noted in the ordinary type are here much larger. The loss of blood in the urine and by nosebleeding may be severe. This form appears most commonly in feeble children, but children nearing puberty and adults may suffer from this disease, although they have been in excellent health previously. Death is rarely postponed beyond the third day of the disease.

**Fulminating** (Toxic) scarlet fever is characterized by an extremely serious onset, with fever to  $107.5^{\circ}$  F. or more, delirium, great restlessness and often convulsions. Dyspnea is extreme. Coma and death commonly follow before the end of the second day after the onset.

**Anginose** scarlet fever is characterized by the severity of the throat symptoms. A thick fibrinous membrane forms over the inflamed tonsils, throat and nostrils, and this may extend into the trachea and bronchi or into the Eustachian tube and the middle ear. The lymph nodes of the neck become greatly enlarged. The tissues of the throat become necrotic and a very fetid odor follows. Death usually occurs from toxemia within a few days. If life persists there is great sloughing of the necrotic tissue; the jugular vein or carotid artery may be opened. Fatal hemorrhage is then inevitable.

**Septicemic** scarlet fever is due to secondary infection by the ordinary streptococci during the second week. Death occurs from septicemia a few days later.

### Complications and Sequelae

**Nephritis.** As in almost any high fever, the urine shows albumin, casts and renal epithelium in increased amounts (febrile albuminuria). No further renal symptoms may occur or definite nephritis may appear during the second week or later. This may be mild, and disappear completely, may be mild and lead to later renal disease of a serious nature, or may be severe from the beginning. Edema of the glottis may cause death, with slight or no previous symptoms of renal disease. The edema may be marked in the face, especially in the eyelids; the feet may swell somewhat, and the urine show some blood, albumin and casts more abundantly than in the milder forms. Recovery is postponed for weeks, sometimes for years.

In serious renal conditions, which may be associated with mild or severe scarlet fever, the urine may be suppressed or may be scanty

and bloody, and full of cells and casts. Vomiting, convulsions, uremic coma and death follow within a day or two in most cases.

**Arthritis.** In scarlet fever with pyemia one or more of the joints may undergo suppuration. This form is usually fatal. A scarletina arthritis, somewhat resembling gonorrheal arthritis, often occurs during the second or third week of scarlet fever. Several or many of the small joints may be affected. Cardiac, choreic, pleuritis or hemorrhagic symptoms may be associated with the arthritis.

**Pulmonary** complications are rare. Empyema, bronchitis and bronchopneumonia are dangerous when they do occur.

**Cardiac** complications are probably invariable in the septic or the very severe cases of scarlet fever. Purulent pericarditis or endocarditis terminates the progress of septic scarlet fever in a considerable proportion of cases. In ordinary cases the heart may be injured, but no symptom be noted until the child makes some strenuous exertion during convalescence. Toxic myocarditis is fairly common; it may cause death very shortly, or may permit dilatation of the heart and permanent cardiac disability.

**Nervous** complications include chorea, hemiplegia, progressive spinal paralysis, permanent mental defect, and other less common nervous disorders. Thrombosis of the cerebral sinuses is not an uncommon result of severe scarlet fever.

Ear complications and sequelae are common. The inflammatory processes reach the middle ear by way of the Eustachian tubes. Scarlet fever is the most common cause of deafness. Suppuration of the mastoid cells, and suppuration and perforation of the ear drum are common. Necrotic processes may follow the middle ear disease, and the facial nerve be involved. Facial paralysis is often due to this accident.

**Adenitis.** In almost any case of scarlet fever the lymph nodes of the neck are swollen. The swelling may be extreme and the entire neck become involved. Great destruction of tissue, perhaps with erosion of the walls of the blood vessels and fatal hemorrhage, sometimes follows the disease. In other cases the lymph nodes diminish in size with the subsidence of the acute stage of the disease, but after recovery seems to be complete the nodes again become swollen and chronic adenitis may supervene.

**Treatment.** The temperature of the room should be kept at 75 or 80° F. and the air should be kept very moist in all cases in which respiratory symptoms are annoying. If symptoms of pneumonia occur, the treatment advised for that disease may be employed. The application of the pneumonia jacket should not be postponed until some form of pneumonia is definitely present.

The treatment for exanthems in general is indicated. The eyes require especial care. The room must be darkened until the child

is comfortable. The thin rays of light that enter around the edges of the curtains or through a partly closed door are especially troublesome. The room should not be darkened more than is necessary to secure the comfort of the child. Sudden increase in the light, such as is due to opening a blind to the sunshine or turning on an unshaded electric light, is especially painful and harmful.

A screen may shade the eyes from any glare, and this may permit the room to be only moderately dim.

The application of a small amount of vaseline along the edges of lids, in conjunctivitis, prevents them from sticking together during sleep.

Soft linen folded into light pads, may be dipped into cool water and laid over the eyes. These should be changed at intervals of two or three minutes. Ice water may be used for this purpose, if the cool water does not give speedy relief.

The head should not be kept too low, if cough is annoying. The pillow which keeps the neck in a straight line is correct. The head may be slightly elevated if the cough is annoying or if the child is more comfortable, for a time, in that position.

During the period of the rash, the skin may require especial care. Warm or tepid sponging gives relief when the skin is dry and harsh. Any pustules which appear may be opened under aseptic conditions. They result from secondary infection. When desquamation begins the skin should be kept well softened with oil, vaseline or cold cream. Carbolated vaseline gives relief to the itching in many cases, and this keeps the skin soft. Cloths which are used to apply anything to the skin should be burned as soon as possible. Old soft thin cloths are best to use in drying the skin or in applying the ointments. An occasional warm bath with a bland soap, thoroughly rinsed off with several clean waters, may be followed by the application of oil or vaseline and this gives great relief.

When the temperature reaches normal, the diet may include milk, whey, buttermilk, junket, ice cream and toast water. After the temperature has remained normal for five days the child may be up and around the sick room. He may then have custards, toast and butter, bread and milk, baked potato, baked apples and any fresh or canned fruit he likes. Eggs, meat broths and meat are to be omitted from his diet for at least a month after the temperature remains normal.

A child recovering from any infectious fever must avoid exposure or chilling, over-fatigue and improper diets.

If the child does not regain his usual health within two or three weeks after recovery from a disease of moderate severity, the possibility of tuberculosis should be considered. The child should then be sent to a warm dry climate if this is possible, and should receive the treatment outlined for early or incipient tuberculosis.



### Prognosis

Children of school age nearly all recover. Hemorrhages, delirium, very high fever, serious throat symptoms and enlargement of the cervical lymph nodes are all unfavorable signs. Children under six years old offer a more serious prognosis; the younger the child, the more apt he is to die. Little babies are very apt to die.

Nephritis, endocarditis, deafness and chronic arthritis are fairly common sequelae of scarlet fever. These are less often found in osteopathic than in medical practice.

### MEASLES

(Morbilli; Rubeola)

Measles is an acute, febrile disease, self-limited, with marked involvement of the upper air passages and with a characteristic eruption.

**Etiology.** Almost no immunity is conferred by anything other than an attack of the disease. Susceptibility seems to be somewhat increased by interosseous lesions, especially those of the lower thoracic vertebrae and the corresponding ribs. Babies less than a year old very rarely contract measles. Infants seem to share the mother's immunity for about six months. Adult life, in itself, does not seem to cause immunity, since in the Faroe Islands 99% of the adults exposed to the disease contracted it. Very rarely, even among children, personal immunity exists. In some cases it may be that a previous mild and unrecognized attack conferred the immunity.

Epidemics vary in severity and in infectiousness. Mild types confer immunity, and mild types spread the virus widely. Winter and spring are favorite seasons for measles.

The infectious agent has not yet been isolated. A filterable virus made from the nasal secretions or the blood of infected children has been used to give the disease to monkeys. Further study is needed. The blood, the nasal secretions, tears, saliva, sputum and the skin are known to harbor the virus.

The germ does not live very long outside the body, in which equality it differs from the germ of scarlet fever and small-pox. It does not seem to be transmitted by fomites nor to be carried from one to another by a third person, not himself infected. It is probably transmitted chiefly by the nasal and buccal secretions. Infection may occur if the healthy child simply enters the sick room, without there being any actual contact, or even any proximity less than the diameter of the room.

### Progress of the Disease

The period of incubation varies from seven to fourteen days. Epidemics vary in this respect. Leukocytosis, slow pulse and slight

swelling of the lymph glands have been reported. Coryza may be present.

The onset is either gradual, with naso-pharyngeal symptoms and fever, or abrupt, with chilliness, fever, headache, nausea, vomiting and occasionally convulsions. Catarrhal symptoms are almost invariable; sneezing, coryza, redness of the eyes and nose and cough are common initial symptoms. Slight fever with dry skin and edema of the face follow within a few hours. Epistaxis is common. The child is irritable, drowsy or tired and achy. This period persists for a few hours or a day in ordinary cases, but may be prolonged for a week or more. The tongue is furred, the mucous membranes of the mouth are red and may present a punctiform rash. Koplik's spots, or buccal spots are important in early diagnosis. These are small whitish or bluish white spots, surrounded by a red areola, and found upon the mucous membrane of the mouth and the inner surface of the lips. They are most abundant upon the jaw along the line of the molar teeth. They are discrete and are visible only in a strong light, preferably daylight. These spots may appear five days before the rash, or may not appear until the day of the rash. They are present in about 85% of all cases of measles, and are pathognomonic. They might be confused with aphthous stomatitis, but the latter are characterized by a yellow center, thus differing from the white or bluish centers of Koplik's spots. The buccal eruption often precedes the skin eruption, and this also is pathognomonic of measles, when the eruption is characteristic. Small red macules appear upon the hard and the soft palate at about the same time. These are typical measles rash in appearance.

Various erythematous or urticarial eruptions may precede the typical rash of measles by a few hours or a day, rarely longer. These are patchy in distribution and may disappear or may fade into the typical measles appearance gradually. A scarlatiniform rash may lead to erroneous diagnosis at this time; it fades away without attaining the brilliant redness of the scarlet fever rash.

During the third or fourth day the typical rash appears. The forehead, scalp, face or other cranial skin is usually first involved. Within a day almost the entire skin is affected. The feet, hands, legs and forearms may not be invaded until the third day of the rash. The palms and soles are almost invariably affected by the third or fourth day of the rash. The rash is arranged in groups, usually roughly crescentic in form, and separated by skin almost or quite normal in appearance. These areas may become confluent but the skin is never evenly and regularly colored or roughened.

The individual spots are characteristic. At first they are small, light red spots, not elevated or roughened. They increase rapidly to a diameter of a centimeter, become slightly elevated and assume a dull reddish or bluish tint, much darker than the color first noted.

At first they disappear on pressure, but after the bluish or dark red tints appear they do not completely disappear on pressure. This is best seen by pressing upon the skin with a smooth glass slide, such as a microscope slide. The rash reaches its height within two or three days, then fades away within another day or two. A yellowish pigmentation remains, and this may persist for a week or more.

The fever and the catarrhal symptoms increase until the rash is fully developed or until it begins to fade, in most cases. In others the fever and catarrhal symptoms diminish on the second day of the rash. During this period the face is usually swollen; the eyes watering and the lids swollen, the lids may stick together during sleep; photophobia is usually very severe; mouth breathing is compelled by the swelling of the nasal mucous membranes and this gives the child a peculiar stupid appearance during this stage of the disease. Vomiting, diarrhea, delirium and drowsiness are common during the eruption and height of the rash. Itching may be very severe after the appearance of the rash and until desquamation is almost complete.

**The urine** is that of any fever during the period of invasion. With the appearance of the rash it may show the characteristics of nephritis, and this is not usually so severe as that of scarlet fever, nor does it tend to pass into a chronic form to so great an extent. Diazo reaction is usually present during measles. Diacetic acid, an excess of acetone, excess of urobilin and propeptone are common findings in measles.

**The blood** is characteristic. A mild lymphocytosis appears after exposure in most cases. This is followed, in almost all cases, by leukopenia and very marked diminution of the small lymphocytes; they may disappear completely from the peripheral blood. This finding may give a diagnosis of measles before any eruption appears; it antedates the Koplik spots by a day or even three days. During the stage of invasion the lymphocytes appear, and the large mononuclears become relatively abundant, especially during the first day or two of the rash. This blood picture varies greatly from that of scarlet fever or of other febrile eruptive diseases.

**Desquamation** begins about a week after the onset. The areas first involved in the exanthem begin first to desquamate, and the process of desquamation may begin on the face before the soles and palms have shown the eruption. Nearly all symptoms disappear with rapidity when the eruption begins to fade. Conjunctivitis and coryza may persist a few days. The yellowish pigment may persist for a week after desquamation is completed. The desquamation should be complete within a week at most. Very fine, branny scales are thrown off during this period. These do not seem to carry the infectious agent abundantly, as is the case in scarlet fever, but they may carry the infection, and all precautions are indicated.

**Convalescence** is fairly rapid and recovery is usually complete. There may be some trouble with the eyes and photophobia may persist until after recovery seems complete in other respects. Permanent injury to the eyes is not a sequel if the child has been properly protected from light during the period of photophobia.

### Atypical Measles

The period of incubation may be prolonged to three weeks or more. During this, slight catarrhal symptoms are usually noted, with some fever and malaise. If there is no history of exposure to measles this period may give trouble in diagnosis. The blood examination should be helpful in such cases.

The period of invasion is often prolonged, perhaps for more than a week; the child may show catarrhal symptoms, with drowsiness, malaise and some photophobia.

The period of invasion may be shortened, even to a day or less. In certain epidemics the stage of invasion may be greatly shortened.

In general, the period of invasion and the period of incubation together occupy about two weeks; either may be lengthened at the expense of the other. Exceptions to this statement are frequently found.

The initial symptoms vary greatly. Nervous symptoms, such as convulsions and delirium may predominate, so that the diagnosis is not possible before the appearance of the rash. Respiratory symptoms may predominate to such an extent that pneumonia may be suspected. These symptoms clear up with the height of the eruption.

Mild forms are noticed. These are very common in osteopathic practice. The child receives correct treatment after exposure and during the onset of the disease. He may not be confined to his bed, may suffer slightly from catarrhal symptoms and photophobia, and the rash may be so pale and so scanty that the diagnosis is difficult.

Measles without eruption (*rubeola sine eruptione*) and abortive measles also are fairly frequent in osteopathic practice. The onset is that of the ordinary type, but the symptoms disappear very rapidly. The rash is absent or is very light in color and scanty in distribution.

Measles without catarrhal symptoms (*rubeola sine catarrho*) has been reported. Its diagnosis is probably impossible except during an epidemic, with other children in the house suffering from typical measles.

Prolonged cases are fairly common, especially among depleted children. The catarrhal symptoms and the fever persist for a week or two, and the bronchial symptoms are severe. Convalescence is also prolonged and pulmonary disease may follow.



Severe cases are also fairly common. The onset is more severe than usual, but it may be of the ordinary type, followed by the development of extremely serious symptoms. Delirium is frequent and may be profound, the fever may exceed  $104^{\circ}$  F., and the eruption is widespread, deeply bluish-red in tint and is followed by abundant desquamation.

Other severe cases seem to be due to subnormal resistance on the part of the child. The symptoms may not be severe but prostration is more marked than the symptoms account for. The rash appears late and is scanty. It often disappears, but may be brought again by warm baths or by friction.

The typhoid form shows slight or no rash, but the child passes into a typhoid state with delirium, convulsions, great prostration, rapid weak pulse and high fever. This form may be fatal.

Malignant measles has an abrupt and exaggerated onset, with very high fever, perhaps to  $108^{\circ}$  F. or even higher. Death may prevent the development of the rash, or this may be found after death.

Hemorrhagic measles, black measles, is diminishing rapidly in frequency. It is found only in very frail and weakly children, and is usually fatal. The eruption is characterized by cutaneous hemorrhages, and hemorrhages into the mucous membranes and the muscles are frequent. The rash is not well developed. Prostration and nervous symptoms are severe.

Variations in the type of the eruption are common. Measles without eruption has been mentioned. Morbilli miliaris shows minute vesicles in each spot. Morbilli papulosi shows larger spots, more deeply red, than usual. Morbilli bullosi is rare; the eruption resembles that of pemphigus, or both bullae and typical measles rash may co-exist. Ecchymotic measles is a form in which the rash is very deeply reddish or purplish, due to minute extravasations of blood. It is not especially severe, and this type should not be called hemorrhagic measles.

Relapse is rare and usually not serious. The term should not be applied to the recurrence of any one or two symptoms, or to the increase in the rash after it has seemed to be limited, or even to show beginning desquamation.

### Complications

Complications and sequelae may be very serious in babies and runabouts. Children of school age are not often seriously affected by these; exceptionally very serious after effects may follow measles in children apparently normal before the attack.

Respiratory sequelae include chronic rhinitis, ulcerative, membranous or chronic laryngitis, fatal stenosis of the larynx, bronchopneumonia and tuberculosis as fairly common symptoms. Lobar

pneumonia, bronchiectasis, gangrene of the lungs and pleurisy with effusion are rare sequelae of measles.

Gastrointestinal diseases may be sequelae. The catarrhal stomatitis which is a symptom of the disease may develop into ulcerative or gangrenous stomatitis. Streptococic or diphtheritic pharyngitis may follow measles. Chronic diarrhea is not an uncommon sequel of measles in little children.

Otitis is a common complication. After measles this may become chronic and deafness result; this is less common after measles than after scarlet fever.

Conjunctivitis, a symptom in measles, may be followed by keratitis, iritis or optic nerve atrophy.

Circulatory complications and sequelae are not common. Rarely endocarditis, pericarditis, myocarditis and peripheral thrombosis occur. Gangrene of a limb may follow the latter accident.

Nephritis is usually mild, but serious cases have been reported. Nephritis is less serious, as a rule, in measles than in scarlet fever. Ulceration or gangrene of the vulva may follow measles.

Very rarely generalized cutaneous emphysema, furunculosis, gangrene, herpes, urticaria and erythema follow measles. Arthritis, osteomyelitis and necrosis of bone are also rare sequelae.

Nervous complications or sequelae are rare. Paralysis may be cerebral, spinal or peripheral. Chorea, epilepsy and tetany may occur during an attack of measles or may be first noted after recovery. Mental deterioration and a persistent apathy have occasionally complicated or followed measles. Convulsions occurring during an attack of measles may be a serious complication. One or two convulsions at the onset have no particular significance.

Measles may be associated with other acute infectious diseases. Measles with scarlet fever, measles with diphtheria and measles with tuberculosis are especially unfavorable combinations. Pertussis is usually epidemic at the same time as measles, or immediately before or immediately after an epidemic of measles. Varicella, influenza, typhoid fever, and erysipelas often occur with measles. Measles seems to lower the immunity of the child to every other infectious disease, hence the relationships.

**Treatment.** The methods employed for the acute exanthems in general are indicated. The skin may require especial attention during the rash. Applications include lotions and ointments. A cool sponging with a weak solution of soda, borie acid or very weak carbolic acid may give relief to the unpleasant sensations during the rash. During desquamation any non-medicated soft ointment gives some comfort.

Measles is characterized by the rapidity with which reflex muscular contractions occur, and the tendency which these reflexes show

to produce definite lesions. This suggests the constant watchfulness necessary in order to avoid the complications and sequelae due to such lesions.

Respiratory complications and sequelae are avoided chiefly by maintaining normal structural conditions of the ribs and the thoracic vertebrae. The condition of the thoracic inlet is important. Lesions of the clavicles, the first or the second ribs, the sixth and seventh cervical or the first and second thoracic vertebrae diminish the size of the inlet, while contractions of the scaleni or other anterior cervical muscles increase the crowding of the important tissues passing through this narrow space. Cardiac, respiratory and nervous complications and sequelae may often be avoided if the thoracic inlet is kept normal.

Auditory and ocular sequelae are avoided by maintaining a normal condition of the cervical vertebrae and the tissues of the neck, and by avoiding excess of light and of sound in the sick-room.

**Prognosis.** Measles is rarely a fatal disease, having about 2% mortality in home cases. Hospital cases have about 5% mortality; this on account of the fact that children in hospitals are, for the most part, already in rather a depleted condition. The younger the child, the more gloomy the prognosis. (The older the adult, the more gloomy the prognosis. The higher the fever at onset, the more atypical the rash, the graver the prognosis.)

Complications and sequelae, which have been mentioned already, cause more deaths than does the disease itself.

## RUBELLA

(Rotheln; German Measles; rubeola notha; epidemic roseola)

This disease shares the characteristics of scarlet fever and measles. No immunity is conferred by one of the three diseases against another, and intermediate cases are unknown. Like the other diseases of this type, the infectious agent has not yet been isolated. Epidemics are extremely extensive.

The stage of incubation is longer than in other similar diseases, from two to three weeks.

The onset is not severe, with chilliness, coryza, pain in the head, back and legs, and some malaise. The symptoms are much less severe than in measles or scarlet fever. A macular, brilliant red eruption is found in the throat on the first day; this resembles the throat conditions in scarlet fever. Fever rarely exceeds 100° F. The cervical lymph nodes are swollen, and the lymph nodes of all the body may be enlarged.

The rash appears within the first three days, sometimes on the first day, usually the second. It appears first on the face, then on the chest, whence it spreads over the body. The spots are roundish

or oval, pinkish or reddish in color, slightly elevated, and they are usually discrete. They may become confluent. The spots are brighter than in measles, and they do not present the crescentic groups usually found in measles. The rash persists for one to four days, and then desquamates slightly. The skin is left somewhat stained after desquamation is complete.

Complications are rare. Nephritis, arthritis, pneumonia, colitis and icterus are associated with rubeola in some epidemics. Sequelae are not to be anticipated. Very rarely some ill effects follow.

The treatment and isolation are those of other contagious, exanthematous febrile diseases.

## FOURTH DISEASE

(Duke's Disease)

This disease resembles both scarlet fever and rubella in certain respects. It is most common during an epidemic of scarlet fever or measles. Fourth disease does not confer immunity to any other disease, but it does confer immunity against its own recurrence. Probably many cases supposed to be a recurrence of scarlet fever, measles or rubella are really due to one attack of Fourth Disease and one attack of the other exanthem.

The incubation period is about two weeks, but may be one or three weeks. Prodromes are slight or absent. The cervical lymph nodes are enlarged, as in rubella. The rash appears suddenly, covering the entire body within a few hours, but the face may be exempt. The rash resembles that of scarlet fever, but it appears in splotches with intervening areas of normal skin. This arrangement may suggest the rash of measles. The rash fades with two days or so, and there is usually a scanty, fine, branny desquamation, though sometimes the desquamation resembles that of scarlet fever.

The fever rarely exceeds 101° F., but may reach 103° F. The pulse and respiration are only slightly increased. Constitutional symptoms are slight or absent. Complications and sequelae are very rare.

Fourth disease is distinguished from other exanthems by the absence of vomiting, nausea, tachycardia, strawberry tongue, Koplik's spots, sore throat or high fever.

Treatment is that given for any acute infectious exanthematous disease. Although the child is not very sick, he must be isolated in order to prevent giving the disease to other children. The disease is contagious for ten days after the child seems well.

Prognosis is excellent for speedy and complete recovery, with no unpleasant symptoms appearing later.



**EXANTHEM SUBITUM**

(Roseola Infantilis)

This is an acute infectious disease characterized by a macular or maculo-papular rash, occurring in children less than two years old, with complete recovery and slight constitutional symptoms.

**Etiology.** The cause of the disease is not known. It occurs in children for whom it is not possible to find exposure to any sickness. Contagiousness has not been demonstrated. The disease does not appear in persons who care for the affected children.

**Symptoms.** The onset is sudden, with a temperature of 101° F. to 105° F. The fever falls by crisis after about four days. A mild pharyngitis usually is present on the first day or two. With the crisis the eruption appears, macular or maculo-papular, not itchy, most abundant upon the anterior surface of the body, from the line of the mandible to the pelvis. The rest of the body shows the exanthem, but the macules are scattered. Coalescence has occasionally been reported. The skin between the lesions is normal. The color disappears with pressure.

The glands do not enlarge. No digestive symptoms are present, other than those which may co-exist.

The rash persists for about a day, usually; it may remain two or three days. It fades somewhat gradually, and there is no evidence of any evil after effects.

Treatment is that of other acute exanthematous diseases.

Recovery is usually complete within two days after the crisis.

**ATYPICAL EXANTHEMS**

Several diseases have been reported which bear some resemblance to measles, scarlet fever or the Fourth Disease, but which are not properly included with any of these.

Pseudorubella resembles rubella in everything but the rash, or in everything but the catarrhal symptoms, or both rash and catarrhal symptoms may be absent. The disease is most commonly found in babies less than a year old, it occurs during epidemics of rubella, is not contagious, and it seems to confer immunity to rubella in about the same degree as the typical case.

Pseudomorbilli and pseudoscarlatina have been described. The reports of these diseases vary, and it seems probable that some of the cases described are rashes due to digestive disorders or to heat, to the "Fourth Disease", or to atypical measles or atypical scarlet fever.

## CHAPTER LXXXIX

### SUBACUTE INFECTIOUS DISEASES

Several diseases have a prolonged course, are infectious but not contagious, and may be terminated at any time by proper treatment, or without any recognizable cause for recovery.

#### MALARIA

This is an infectious, non-contagious disease, due to the presence of a sporozoa, the plasmodium malariae (hematozoon malariae; hemameba) in the blood. This plasmodium passes through two phases, one of which is spent in the body of the mosquito, the other in the blood of a mammal. Several types are concerned in causing the different types of malarial fever.

All of these are first found in the blood as very small ameboid hyaline bodies; all invade the erythrocytes, undergo asexual multiplication, destroying the erythrocytes and being set free in the plasma at the time of the chill. All persist in the body for a long time, not yet definitely known, but probably for many years. In all types there may be some of the organisms taken by a mosquito from the capillaries of the skin, and in the body of the mosquito the parasites undergo sexual reproduction. The organisms resulting from this multiplication in the body of the mosquito are inserted into the human body by the bite of the mosquito and the cycle begins again.

The Anopheles mosquito is the only one which can serve as an intermediate host for the malarial plasmodium; several varieties of the Anopheles are found in the United States. The culex, an abundant mosquito, is innocent of transmitting malaria. The fact that the disease is transmitted by the mosquito which flies by night and which has its abode in stagnant water is responsible for the name of the disease (malaria, bad air) and also for the old fear of "night air".

The Anopheles is easily recognized by the fact that the wings are somewhat spotted. The anopheles sits with the body at an angle of about 45° or more, and appears to be hanging by the proboscis with the long hind legs hanging or lying loosely. The anopheles also has two long palpi, so that he seems to have three probosci.

The culex, the ordinary and more abundant mosquito, sits with the body parallel to the surface which supports him, has the hind legs raised over the back, has short palpi so that the single proboscis is visible and has no spots on his wings.

#### Types of Malaria

**Tertian** malarial fever. The plasmodium vivax has its human life-cycle within about 48 hours. About 24 hours after the organism

enters an erythrocyte it has grown to almost the size of the erythrocyte, has segmented, become pigmented from the hemoglobin of its host, and at the time of the chill 15 or 20 small spores are set free. Each of these enters another erythrocyte, within about 24 hours, again undergoes multiplication as before, and thus a chill is produced on alternate days. Double infection by this organism produces a daily chill, because two sets of malarial parasites are engaged in multiplication. At any time the bite of a mosquito may cause additional infection, and at the same time the mosquito may take into its own body some of the spores resulting from the asexual division within the erythrocytes, keep them while they undergo the sexual division, and thus continue the re-infection of the human subject indefinitely. There seems no limit to the time of persistence of the asexual parasites within the human body, but the definitely limited life-cycle with the associated chills and fevers becomes broken up so that no recognizable symptoms occur.

**Quartan** malarial fever. The plasmodium malariae of quartan malarial fever has a life-cycle within the human body of 72 hours. It grows within the erythrocyte for about 48 hours, then becomes pigmented, and within about 60 hours the entire mass of the erythrocyte is filled with the mass. This segments radially, forming a star-like group of 8 or ten spores. These break up, destroying the erythrocytes, about 72 hours after the erythrocyte was first invaded, and at this time the patient suffers a chill. There may be mature bodies which do not segment, but which undergo division only after they have been taken into the body of the mosquito in this, as in the tertian type.

**Estivo-autumnal** malarial fever (tropical fever) is due to the presence of the plasmodium precox. This organism has a variable period of life-cycle, and is much smaller than the other forms. It undergoes its most active multiplication in the internal organs of the body, especially in the spleen and the bone marrow. About a week after infection certain crescentic bodies are found in the peripheral blood plasma, and these are the forms which must be taken into the body of the mosquito. Flagelated forms may also be found. The invaded erythrocytes are shrunk by the presence of the parasites. This form causes in the human body a remittent type of fever and this is a more serious disease than the intermittent fevers caused by the tertian or quartan malarial parasites.

Definite immunity, in the sense that there is immunity to the bacterial infections, is not known in the case of the malarial plasmodium, nor, indeed, for any infectious agent of animal character. Probably all persons receiving the bite of an infected mosquito become malarial. Still, there are many persons who do not display any symptoms of malaria, though the parasites can be found in the blood if many slides are examined. Such persons may show malarial

symptoms when ill health results from any other cause. That there are agents in the body destructive to the plasmodium seems evident. The parasites are occasionally found within the splenocytes and other large hyaline cells, and these are somewhat increased in malarial blood.

Any condition which interferes with the circulation through the liver and the spleen diminishes the power of any individual to overcome the infection. Lesions of the seventh to the eleventh thoracic vertebrae and the corresponding ribs interfere with the normal circulation and innervation of these organs. After malarial invasion, the spleen and liver become enlarged, and the muscles of the back and lower thorax become contracted, the thorax becomes rigid, and the circulation is impeded through the spleen, liver and intestines.

**The pathology** of malaria in children is that of the same disease in adults. The liver is enlarged, is slaty-gray in color, and shows many small necrotic foci. The erythrocytes in the hepatic vesicles show comparatively few plasmodia. The spleen is greatly enlarged, is soft and it contains many areas abundantly filled with leukocytes, including great numbers of necrotic cells. The splenic arteries and capillaries contain erythrocytes with many parasites. The splenic veins contain comparatively few plasmodia within erythrocytes, but leukocytes filled with pigment and with the granular debris from destroyed erythrocytes are abundantly present in the splenic veins. The kidneys and other viscera show the changes common to nearly all of the infectious diseases.

Children are rather more subject to malaria than are adults, but in little children the symptoms are atypical. It has, for that reason, been supposed that little children were immune to the disease. The blood of newly born babies shows the plasmodium when the mother has suffered from malaria during the last weeks of pregnancy.

From what has been said of the life history of the plasmodium, it is evident that the disease is endemic, and that localities free from the anopheles mosquitoes are also free from malaria, except that persons with malaria may enter such places and continue to suffer from the disease. They cannot give the disease to other persons, however.

### Periods of Fever

The tertian fever occurs once every other day, if the disease is due to a single infection. If the two infections have occurred on different days, the fever occurs daily.

The quartan fever occurs every third day. If two infections have occurred, on different days, every third day is free from fever. If three infections have occurred on three different days the fever occurs daily.



If either tertian or quartan fever is due to several different infections on different days and at different times in the day the fever may be very irregular in occurrence and in severity.

If estivo-autumnal fever is present, the parasites show considerable irregularity in development and appear in several generations. The fever is irregular for these reasons.

In children the fevers tend to be irregular no matter what the type of parasite.

### Symptoms

The onset of any paroxysm is rather abrupt. In children the chill is apt to be replaced by nervous and digestive phenomena. Vomiting, delirium, convulsions and prostration are common. Apathy or somnolence, feeble respiration with rales, nervous twitchings, all usually with coldness of the hands and feet and sometimes with apparent collapse, may replace the chill in little children. In older children there may be the chill, as in adults. Headache is common and sometimes sharp pain in the epigastrium occurs instead of the chill.

The fever rises to 104° F. or to 106° F., occasionally higher. It persists for a few hours, subsides by lysis, and within a few hours the child seems perfectly well again, or he may still suffer from weakness, malaise, headache and some general aching and tenderness.

Sometimes the onset is gradual, with dull aching, headache, drowsiness, anorexia and occasional nausea.

Physical examination shows the enlarged spleen and sometimes the enlarged liver. In very early cases there may be no perceptible enlargement of the spleen.

The blood should be taken for examination just before the time for the chill or during the paroxysm. The plasmodium can be found in the erythrocytes when the smear is stained with any of the common basic stains. The leukocyte count is rather lower than normal, and this differentiates sepsis. The differential count shows slightly diminished neutrophils, increased hyaline cells, and especially an increased number of splenocytes and large hyaline cells.

When the infection has been present for some weeks, the blood cells show the usual characteristics of secondary anemia.

### Prophylaxis

The malarial patient should be protected from mosquitoes in order to protect himself against further infection and also in order to guard against the transmission of the disease by the mosquitoes to other persons.

Children living in a malarial district should be protected against mosquitoes both day and night, and they should not be allowed to be out of doors at night without protection from the mosquitoes.

The best prophylaxis is the drainage of the swamps and pools. Even an old can with stagnant water in it may harbor the mosquitoes. Pools which cannot be drained may be covered by a thin film of kerosene, which prevents the development of the larvae.

### Treatment

Any lesions found upon examination must be corrected. The most common of these have already been mentioned. Thoracic rigidity must be relieved by raising the lower ribs and relaxing such muscles as may be found contracted. The lesions are not easily corrected after the disease has been present several weeks or more.

Treatment given just before the time for the chill or other symptoms to appear may abort the paroxysm, so that only a short period of mild fever occurs. This treatment must be devoted to correcting the lesions in a vigorous and energetic manner.

Convulsions, vomiting and fever should receive the treatment for these conditions.

During the intervals the child should receive daily treatment and all lesions be thoroughly corrected. Muscular and soft-tissue lesions are especially abundant in these cases.

The administration of beef juice and beef steak is advised by Dr. Armstrong. Excellent results are reported. The amount given depends upon the age of the child. Babies are given one to five teaspoons of beef juice, well diluted with water, after nursings. Runabouts may have a broth made from one or two teaspoons of beef juice with the juices of any vegetables which the child likes. Older children eat one or two ounces of beef steak, not too thoroughly cooked, each day. Starchy foods are kept at a minimum, and the raw and cooked vegetables given in abundance. The destroyed erythrocytes and hemoglobin are speedily replaced in this way. After the paroxysms have ceased, a diet rich in vitamins is indicated.

Change of climate, preferably to a dry warm climate where there are no mosquitoes, is excellent. Convalescence is greatly hastened by the change.

**Prognosis.** The severe types found in adults are rare during childhood. The outlook is excellent for speedy recovery with proper treatment and protection against mosquitoes.

After the first treatment, the paroxysms should be diminished in intensity. The time required for complete recovery depends upon the extent of the infection, the condition of the child and the efficacy of the methods employed for protection against mosquitoes.

## RHEUMATISM

Rheumatism is a subacute or chronic disease characterized by pain in the joints and muscles, slight fever and a marked tendency toward endocarditis. It is unquestionably one of the infectious diseases, yet because its appearance is due to constitutional or metabolic disorders, it is often included in that group of disease.

**Etiology.** In infancy rheumatism is very rare. In children of the runabout age, it is fairly common. Bad hygiene and especially exposure to cold and dampness are important etiological factors. Excessive acidity of the blood has been considered an important exciting agent, but this now seems not to be true.

Vertebral lesions vary, but usually include the tenth thoracic vertebrae.

A form of streptococcus is probably always present in rheumatism, and it now seems probable that the tonsils or some other infected lymph-node provide a constant nidus for these bacteria. During the intervals, the bacteria remain quiescent. An attack is initiated by anything which diminishes the resistance of the child's body to these bacteria; they engage in rapid growth and an acute attack then supervenes. The symptoms vary in different children and several types of rheumatism are easily distinguished. In no case can the typical rheumatic attack of adults be expected to occur in children under twelve years of age.

### Types of Rheumatism

**Muscular Rheumatism** (Rheumatic Myalgia). The occurrence of pain in the muscles with soreness and stiffness is not rare in childhood. It is unfortunate that these transitory pains in the muscles should have received the name of "growing pains." Too often parents consider these as normal manifestations of growth and the rheumatism is thus permitted to remain unnoticed. Permanent heart injury may result from such neglected cases. Torticollis results when the cleido-mastoid muscles are affected. Typical lumbago and pleurodynia are rarely present.

**Acute articular rheumatism** resembles that found in adults. Sore throat with fever and anorexia, chilliness, and generalized discomfort associated with the fever are first noted. The temperature may reach 103° F. or more during the first day, but usually falls to 101° F. within twenty-four hours. The affected joints become red, swollen and painful, though usually less painful than is the case in adults. The cervical vertebrae may be affected, and in this case the diagnosis may be somewhat difficult. Many joints in turn, or simultaneously, may become swollen and painful, though this is rare in childhood. The severe suffering and the abundant sweating characteristic of the disease during adult life are also rare during childhood.

After the age of twelve attacks resembling those of adult life are occasionally found. The pain and tenderness in these cases are very marked, the slightest jarring causes exquisite pain. The urine is small in quantity, intensely acid and often shows abundant urates. Perspiration is abundant and a peculiar sour odor is noticed about the body, the blood shows marked leukocytosis. In prolonged cases, anemia occasionally resembling that found in pernicious anemia may result. Successive joints are attacked and the disease may become chronic.

In mild cases recovery may occur in ten days or so, relapses are common, and rarely the disease becomes chronic.

**Chronic articular rheumatism** (rheumatoid arthritis, arthritis deformans). A chronic form may supervene upon prolonged or repeated attacks of the acute rheumatism. The hips, fingers, jaws and cervical vertebrae may be affected. Leukocytosis usually runs from ten to twenty thousand per cubic millimeter, anemia becomes very severe in most cases. Endocarditis usually results, and cold, clammy sweat is characteristic. Affected joints become greatly swollen and a peculiar gritty sound and feeling becomes apparent when they are moved. The skin over the affected joints is red and shiny, the muscles which move these joints become atrophied. The cartilages, the ends of the bones and the para-articular tissues are especially involved in arthritis deformans; ankylosis frequently results.

**Still's Disease** is characterized by progressive involvement of the joints; these are enlarged and stiff, but they are not painful, or at least, become only slightly painful, and no destructive processes are found, fever varies. The spleen and the lymphoid tissue generally show hyperplasia.

**Cardiac Rheumatism.** The valves of the heart are very frequently affected in any form of rheumatism. Rarely the cardiac symptoms may be the first sign of rheumatism. Endocarditis is the most common lesion; pericarditis, and myocarditis occasionally occur; the mitral valve is most commonly affected, though none of the valves of the heart are immune to the infection.

**Chorea.** Choreic symptoms occasionally substitute for the articular in definite cases of rheumatism. Chorea is often associated with other rheumatic symptoms, for it is possible that certain forms of chorea are not rheumatic in nature. Since choreic symptoms are notably nervous in character, the fuller description of chorea is included in diseases of the nervous system.

**Nodules.** Certain peculiar connective tissue formations are present in any form of rheumatism. These are rather more common in children than in adults. They may appear in subcutaneous connective tissue, in the heart muscle or in the joints. They vary from a



millimeter or so to a quarter inch in diameter; they are not red or tender. They are rather symmetrical when they are subcutaneous and there may be a hundred or more present at one time, or only a very few may be found. After the attack of rheumatism subsides, these nodules undergo a very slow atrophy, rarely they become calcified and persist as slight permanent deformities.

Because of the many forms in which rheumatism appears, its diagnosis is not easy; the presence of valvular lesions or of growing pains, muscular stiffness or pain, articular pain, choreic movements, repeated tonsillitis or sore throat should lead to a suspicion of a chronic rheumatic state.

### Differential Diagnosis

Of the diseases sometimes confused with rheumatism, a few may be mentioned:

Osteomyelitis is associated with more severe and acute constitutional symptoms and involves the shaft of the bone and the epiphyses rather than the joints. It is usually distinctly localized and a history of injury may usually be found.

Secondary arthritis follows in any of the acute infections; the history of the case should make this diagnosis easy.

Gonorrheal arthritis is usually associated with vaginitis or conjunctivitis. It is rather more often polyarticular in early life than it is among adults.

Syphilitic arthritis is usually associated with other syphilitic symptoms, and usually affects both knee joints.

Septic arthritis is purulent and is always associated with other symptoms of pyogenic infections.

In babies scorbutus may cause pains in the limbs, but other symptoms of scorbutus are found.

Poliomyelitis may cause pain resembling that of rheumatism, but the further progress of the disease makes the diagnosis clear.

Tuberculosis may imitate rheumatism, but other typical symptoms should be easily recognizable.

Neuritis is rare in childhood and the lack of articular or cardiac involvement should make the diagnosis clear.

### Treatment

Prophylaxis is very important. Children in a rheumatic family should receive careful attention. Cold and damp and especially dampness of the feet must be avoided. Abundance of sunshine and fresh air is very important. It is necessary to avoid coddling these children, and systematic bathing and exercise are of great importance. Children who are subject to attacks of rheumatism should, if possible, be taken to a warm, dry climate for the winters, if not permanently.

Dietetic theories are abundant. The restriction of proteids to a low level, the restriction of carbohydrates to a low level, and the restriction of fats to a low level have been advised. It is evident that any marked restriction of any one of these articles of diet is dangerous during childhood. Undoubtedly many children suffer from the lack of vitamin-containing foods, but there is no reason to suppose that this lack is more noticeable in rheumatic children than in others. A good, wholesome, well-balanced diet is indicated during the intervals of the attacks.

The acute attack should receive the treatment given in other acute infectious diseases. No food is permitted so long as the fever persists. Abundant water and diluted fruit juices should be given. If any symptoms of collapse occur, however, a few ounces of thin gruel made from wheat or oats may be given. If the temperature should rise above normal, this should be discontinued. If the temperature does not exceed ninety-nine degrees after the period of collapse is passed, the gruel may be continued, and a gradual return to mixed diet be secured within a few days.

Affected joints should be wrapped in dry cotton and all motion carefully avoided. A cage for the support of the bed-clothes over the affected joints is very useful. Children should be kept in bed and kept warm during the time of acute symptoms. Moist hot applications are sometimes better than the dry heat.

Inhibition of the spinal centers controlling the affected area often relieves the pain and is sometimes followed by a diminution in the inflammation.

During the intervals of the attacks the child's general condition should be carefully investigated. The tonsils should receive such treatment as is indicated upon their examination.

Since the general immunity to infection in children is lowered by vertebral lesions of the lower thoracic area, the spinal column should receive careful examination. Any lesions found should be corrected in order that the nutrition and the resistance of the child should be made as nearly normal as is possible. Cardiac lesions are less apt to occur in children in whom upper thoracic and rib lesions are not present.

### Prognosis

Recovery from any one individual attack is to be expected. The prognosis in children in whom valvular lesions have occurred, depends upon the nature of the valvular lesion and the extent of pericarditis. The presence of pericarditis, in any case, renders compensatory hypertrophy of the heart more difficult. The presence of choreic symptoms makes the outlook for permanent and complete recovery more doubtful. In chronic articular rheumatism recovery is not to be expected. The nutrition of the child suffers progress-

ively, and the anemia becomes more and more marked. Death usually results from some intercurrent disease, such as tuberculosis or pneumonia. In very mild cases, recovery may possibly occur with permanent deformity of the affected joints.

### PURPURA

Purpura is a disease characterized by effusions of blood into the subcutaneous, sub-mucous or visceral connective tissue.

**Etiology.** Purpura is very rare in children under the age of three, or over the age of ten. The sexes are about equally affected.

The essential cause of this disease is not known. A number of predisposing causes are recognized, all of which are associated with malnutrition. The nature of the disease suggests an infectious origin, and in many respects resembles a rheumatic type. No specific infectious agent has yet been recognized. Whether some toxic agent, or some change in the vascular walls, or some change in the quality of the blood itself, is the efficient factor in pathogenesis, has not yet been determined.

**Tissue changes.** In autopsies, the hemorrhages are found scattered through the loose connective tissue of the body. Degeneration of the kidneys, liver and heart are found such as are present in many other types of toxemia. The lungs, brain and joints remain free from hemorrhages.

### Types of Purpura

**Mechanical Purpura.** This is a form not logically included with this disease, but characterized by similar pathological changes. It occurs in any part of the body affected by venous stasis, or when the blood-vessels have become weakened from any cause. It occurs in the legs when a child begins to walk after any long, wasting disease, or when any limb has been bandaged; in pertussis when coughing has been violent; or after an especially severe convulsions from any cause, or after an epileptic attack.

**Cachectic Purpura.** After any debilitating illness either in babies or children, purpuric hemorrhages are frequently found. They occur most commonly under the skin over the abdomen and thorax. Marasmus, diarrhea, empyema, tuberculosis, malignant tumors, leukemia, pernicious anemia, scurvy, and indeed, almost any one of the prolonged and wasting diseases of infancy or childhood, may be associated with these hemorrhages.

**Neurotic Purpura.** This form is very rare in childhood. It occurs as a result of degenerative changes in the central nervous system, or as a result of very severe hysterics.

**Toxic Purpura.** As the result of the presence of bile in the blood, as in any form of jaundice, purpuric hemorrhages may occur.

Less commonly the venom of snakebite, diphtheria antitoxin, and certain drugs, especially the coal tar derivatives, iodides and quinine may cause the appearance of these hemorrhages.

**Infectious Purpura.** Almost any very severe acute infection may cause subcutaneous hemorrhages. "Black" measles, "black" smallpox and "black" typhoid are characterized by this condition. Cerebro-spinal fever, pyemia, and rheumatic purpura, are instances of the effects produced upon the circulation by these infectious agents.

### Idiopathic Purpura

(Werlhoff's Disease, Henoch's Purpura, Purpura Simplex, Purpura Rheumatica, Purpura Fulminans)

These forms of the disease are not easily distinguished, and many intermediate types are recognized.

**Purpura simplex** is mild and usually disappears in a week. The attack begins with headache, diarrhea, slight fever, anorexia, and sometimes nausea and vomiting. Within a few hours, or a few days, numerous small, discrete, round, purple spots appear upon the skin. Extensor surfaces and the back are most commonly affected, but the hemorrhagic areas may appear anywhere upon the body. The face and hands are not commonly affected.

Urticaria and erythema may be associated with the hemorrhages. Recurrences may appear, or the disease may be characterized by several crops. The loss of blood due to the hemorrhages may incite mild anemia. Except for this, the prognosis is good for complete recovery within a few days, or possibly two or three weeks.

**Purpura Rheumatica** (Schonlein's Disease, Arthritic Purpura, Purpura Urticans). This is a more severe form than purpura simplex. The prodromal symptoms are more marked; sore throat is very common, fever usually reaches 101° F. or even more. Pains in the muscles and joints may be very severe. Urticaria and localized edema are common. The joints are swollen, and the hemorrhagic areas usually appear in successive crops.

The prognosis is good for recovery in two to four weeks.

**Purpura hemorrhagica** is more severe than purpura simplex. Bleeding occurs from the mucous membrane as well as in the subcutaneous spaces. Epistaxis, hematemesis, and intestinal bleeding are common. Deficient coagulability of the blood is present and severe hemorrhage may result from slight irritation, or scratching of the skin. Fever is not marked; subnormal temperature is rather common. Prostration and headache are usually present; hemorrhages into the brain may cause symptoms characteristic of meningitis or encephalitis. Albuminuria and edema are common.



The prognosis depends upon the location and the extent of the hemorrhage. Intracranial hemorrhage may be suddenly fatal. Children in whom a typhoid state develop usually die. The disease is followed by a variable period of anemia when recovery occurs.

**Purpura Abdominalis**, or Henoch's Purpura, resembles the rheumatic form during the early stages. After a few days, severe abdominal symptoms, including intense pain, obstinate constipation followed by severe diarrhea with tenesmus and bloody stools, appear. The spleen is enlarged. Severe nephritis with bloody urine is common. The whole picture suggests acute intestinal obstruction. Fever may reach 102° F. or more. This acute abdominal attack subsides after a few days, only to return a few days later. The prostration is marked, and the danger of cerebral hemorrhage is very great.

In spite of the severity of the symptoms, however, nearly all children suffering from this type of purpura recover unless cerebral hemorrhage or very severe hemorrhage causes sudden death.

**Purpura Fulminans.** In this disease, hemorrhage is limited to the subcutaneous tissues, as is the case in purpura simplex. But it differs from the simple form in its severity. The disease begins very suddenly with high fever, great prostration and obstinate vomiting. Ecchymoses appear within a few hours, and they may completely cover the extremities and the face. They are usually symmetrically placed and of a purplish or bluish color. The skin is edematous and there may be bullae containing a bloody serum; albuminuria is usually marked.

Death occurs in from twelve hours to four days.

### Treatment

There is no specific treatment for this disease. The primary disease should be treated in those cases of purpura which are secondary. The child should be kept in bed in all cases, whether he feels ill or not. The diet should include an abundance of the vitamin-containing foods; abundant fresh air is necessary. Local hemorrhages may be treated by means of pressure, or the application of an ice bag.

During convalescence, it is necessary to avoid over-exertion or dietetic improprieties. Change of climate, and especially change of altitude, is often useful.

## PART XII. CHRONIC INFECTIOUS DISEASES

### CHAPTER XC

#### TUBERCULOSIS

Tuberculosis is an infectious disease, usually chronic, most frequently found at first among children and continuing into adult life in a latent form.

##### Predisposing Causes of Tuberculosis

Predisposing causes include all forms of malnutrition, any of the acute infectious diseases, especially measles, influenza and pertussis. It is certain that these diseases lower the resistance of the body to tuberculosis, whether there is already a quiescent tubercular focus or not.

Persistence of the round form of chest, rigidity of the lower thoracic vertebrae and rib lesions are important predisposing causes of tuberculosis.

Heredity has long been supposed to be a cause of tuberculosis, but it now seems probable that many cases supposed to be due to heredity are really due to contagion. The children of tubercular parents are often puny, they may inherit structural peculiarities which predispose to infection and they are undoubtedly affected by considerations of food, diet and hygiene which are usually decided by the parents. Children born of tubercular parents who die soon after the children are born less often contract tuberculosis than do those who continue to live with tubercular parents.

Hygienic conditions are often responsible for lowered immunity to tuberculosis, as well as for the increased opportunity for contagion. Children who are poorly or improperly fed have marked tendency to tuberculosis. Lack of sunlight and fresh air predispose greatly to tuberculosis.

Hypertrophied tonsils and adenoids, repeated attacks of bronchitis and any condition associated with respiratory impediment predisposes to tuberculosis.

Age is important. Children may contract bovine tuberculosis from the milk of tubercular cows. Adults do not contract bovine tuberculosis at all. Congenital tuberculosis occurs as a result of blood-borne infection reaching the fetus through a placenta which is itself diseased. The placenta is extremely resistant to tubercular invasion, but does become infected under certain conditions.

The baby under three months of age is immune to all ordinary tubercular infection, and it is only in the second year of life that this congenital immunity is broken. Of all deaths occurring before

the age of five years, from 16% to 60% are due to tuberculosis. The percentages given by different reports vary according to the living conditions of the area included in the study, and also according to the variations in the methods of diagnosis employed by different physicians and in different hospitals.

Tuberculosis accounts for more than half the deaths occurring between the eighth and the fifteenth years of life. Some authorities give a higher proportion, even to 72% of all deaths being due to tuberculosis in some hospitals.

These findings refer to deaths from tuberculosis and other diseases. The number of cases of tuberculosis contracted during childhood and which persist into adult life cannot be determined. From reports of autopsies made upon adults, it seems that a very large proportion of persons contract tuberculosis during childhood, but overcome the disease itself, so that only the thickenings of the affected tissues remain to indicate that the infection has once been active. The after life of children affected in this manner seems to be unmodified by the occurrence.

### **The Infectious Agent**

The bacillus tuberculosis was first described by Koch. Several types of the bacterium are known to exist, and these are known by the animals which they invade. Of these types two are pathogenic for the human race, the human and the bovine.

Children are susceptible to both of these. Adults and older children are subject only to the human strain. At all ages the human type is more often responsible for the disease than the bovine.

### **Methods of Infection**

The most common method of invasion is by way of the respiratory tract or the digestive tract.

Particles of sputum containing the bacteria are coughed up by the person suffering from pulmonary tuberculosis, these may be breathed in by children and deposited upon the mucous membrane of the larynx, lungs, bronchi or other areas. If any lesion already exists upon these membranes, the penetration of the germ is facilitated, but such lesions do not seem to be essential to infection. The effects produced by the bacteria at the portal of entry may be extremely minute, it may not be possible to find it at autopsy. The lymphatic drainage of this area carries the bacteria to the neighboring lymph nodes, and these very often stop their progress. The bacteria may be killed in these nodes, or they may maintain life and lie dormant for many years. In other cases the lymph nodes undergo tubercular inflammation, the bacteria then are transmitted by the lymph and blood streams to other tissues.

The tonsils may be affected by either food or air. When they are first invaded the cervical lymph nodes usually obstruct the progress of the bacteria to other organs. These may break down and tubercular adenitis result. The bacteria then invade other organs of the body by way of the blood stream.

Particles of sputum from an individual with pulmonary tuberculosis may reach the food or the toys of children and thus be taken into the digestive tract. A small lesion is then formed in the intestine or other area of the digestive mucous membrane, and from this area the mesenteric vessels are affected. These may obstruct the progress of the infection, or they may break down and allow the bacteria to enter the blood stream; either the veins at the affected area, or the lymphatic duct may carry the infected lymph to the blood.

Neutrophilic leukocytes wander through the various tissues of the body and these may carry the tubercle bacilli to widely separated parts of the body. The neutrophiles may kill and digest the bacteria, in which case no harm is done, or the leukocytes may die, leaving the bacteria ready for further injury to the body.

The tubercular lesions are abundantly found in all tubercular foci. In sputum and feces they may be widely scattered. The bacilli live and remain virulent for several weeks in dried particles, and thus they may be scattered with dust and be breathed into the body or scattered over food or toys, and thus the infection is widely spread.

Rarely a vaccination sore or the wound caused by circumcision becomes infected with tubercular bacilli and the disease is caused with the primary lesions on the arm or the penis.

The tuberculous mother may give the disease to the child by bacteria in the milk, but the transmission of the disease by contagion is much more frequent. The mother with frank tuberculosis should not nurse her baby, both on account of the baby's health and her own. She should be associated with the baby only if she is rigidly antiseptic with her own excretions, and rigidly aseptic with the baby's clothing, bottles and toys. If a nurse cares for the baby and she observes proper precautions there is no danger.

The transmission of bovine tuberculosis by means of the milk from tubercular cows presents questions not yet adequately answered. The flesh of tubercular cows probably never transmits the disease. The milk and flesh of tubercular cattle is not a proper food, without regard to the transmissibility of the bacilli of tuberculosis.

Milk may carry the tubercle bacilli which enters it from the unclean hands of tubercular people, from the vessels washed by unclean hands and from the particles of sputum coughed or sneezed into it by tubercular milkers. Babies are in danger of contracting tuberculosis in this way more than they are from the milk of the



tubercular cows. In order to prevent this source of infection, as well as to prevent the possible bacteria which might be derived from cows with tubercular udders, the milk which is given to babies should always be pasteurized or boiled. (It is, of course, necessary to add the vitamins to the food of babies fed upon the cooked milk. Orange or tomato juice is given for the sake of their vitamins and their other food qualities).

### Pathology

The tissue changes in tuberculosis are definite and are easily recognized in nearly all the tissues of the body. The exceptions are mentioned in connection with the diseases of the organs in which they occur. The tubercle is the characteristic finding.

The tubercle is a small structure varying from 127 to 500 millimeters. It is surrounded by connective tissue, and this forms a sort of capsule around the tubercle. The tubercle is composed of hyaline cells which are in part derived from the circulating blood and in part from the tissue cells of the organs affected. Many leukocytes are present also, among the hyaline cells. In young tubercles these are mostly neutrophilic and polymorphonuclear, but as the tubercle increases in size the polymorphonuclear cells die and are digested and absorbed, while mononuclear neutrophiles and large mononuclear hyaline cells take their places. Eosinophiles are abundantly present during all ages of the tubercle. Among the various cells tubercle bacilli are found in varying abundance. Giant cells are frequently found; they are formed in part from the multiplication of the nuclei of the hyaline cells without concomitant division of the protoplasm, and partly by the flowing together of the hyaline cells of the tubercle. Both methods are known to occur, but which is predominant is not yet known. The giant cells are most abundant where the bacilli are fewest, and the bacilli are most abundant where there are no giant cells.

The tubercle increases in size, fails to receive the blood supply necessary for the nutrition of the cells, undergoes degeneration and caseation and often breaks down into soft pus. When secondary infection by the pyogenic bacteria occur, a common condition in the lungs, especially, there is formed a thick yellow pus in which the bacilli of tuberculosis may be easily visible, or they may not be found after the most exhaustive study.

In certain conditions there is not any secondary infection, there is no breaking down of the tubercle, calcification occurs and the tissue becomes practically a foreign body. This process may occur in any part of the body, but is most common in the lymph nodes.

When the tubercular lesions are small and discrete, there may be merely a connective tissue overgrowth which later becomes hardened and finally only a small sclerotic area remains.

Adjacent tubercles may increase in size and become confluent. These may break down and drain. In certain tissues, notably the lungs, considerable cavities may result from these processes.

Small tubercles may remain discrete and be very abundant. This type is called miliary tuberculosis when the tubercles are widely scattered through the organs of the body.

### Tissues Affected

Human tuberculosis tends to involve the respiratory tract first and most frequently. Later other organs of the body may be involved.

Bovine tuberculosis tends to invade the digestive tract first and most abundantly. Later other organs may be involved.

Congenital tuberculosis is usually miliary; the tubercles are widely scattered.

During the first two years of life the bronchial lymph nodes, the lung and the pleurae are involved in the order of their frequency.

During the third to the fifth years of life, inclusive, the pulmonary forms are still most abundant, but tubercular adenitis, meningitis, ileocolitis, osteomyelitis, and peritonitis become fairly common.

During the sixth to the fifteenth years tubercular adenitis and meningitis decrease in frequency; osteomyelitis and peritonitis increase in frequency and the disease approaches the adult form. The pulmonary form is still more frequent than other forms of the disease.

### **Causes of Death in Tuberculosis**

In infancy, tubercular bronchopneumonia is a common cause of death.

In later infancy, tubercular meningitis is the cause of death.

In childhood, tubercular peritonitis causes death.

In all ages, miliary tuberculosis is the commonest cause of death.

Tuberculosis of the cervical, bronchial and mesenteric lymph nodes is very common, but these lead to death only if the disease becomes miliary, or after meningitis occurs. Tubercular pleurisy is also common, but this, in itself, is never fatal.

### **Diagnosis**

The diagnosis of tuberculosis is easy in typical cases, but it is often extremely difficult.

**A "pretubercular" state** is recognized; that is, a condition in which the nutrition of the child becomes subnormal; he fails to gain or may even lose in weight, is rather pale, rather weak, rather nervous and is generally below par, though no localized symptoms are present. The blood in this state shows the characters of mild secondary anemia. The hyaline cells and the eosinophiles are rather high and the neutrophiles rather low for the age of the patient. The hemoglobin is subnormal, but the erythrocyte count remains normal, or may be slightly increased above the normal for the age of the child. The color index is low.

The urine shows deficient elimination of all normal contents, but no other abnormal conditions. The food intake is low, but the urinary excretion is below normal for the food intake.

The child has abnormal cravings in many cases. Dietetic errors are almost invariable, and these usually include a great craving for carbohydrates. It is rare to find a child with an abnormal craving for meat with tubercular tendencies. Probably the child who eats abundantly of the fresh green foods is never found in the pretubercular group or becomes tubercular.

The spinal condition of these children is characteristic. There is an anterior tendency in the mid-thoracic region and this is associated with rigidity of the sixth to the eleventh thoracic vertebrae. This rigidity is invariable, no matter what the location of tubercular

lesions. The ribs are more nearly horizontal than is normal for the age of the child, and the thorax is always somewhat less flexible than normal.

The lumbar curve is somewhat exaggerated, and the lumbar and cervical regions show areas of greatly increased mobility, often associated with neighboring areas of rigidity and lesions.

If these children receive the proper treatment, definite and recognizable lesions may never occur. If they receive no treatment and remain in unhygienic surroundings, with inappropriate foods, they may still recover, apparently completely. In other cases, without proper care or good food, they become recognizably tubercular and die from intestinal, pulmonary or meningeal involvement.

**Primary tuberculosis.** This stage is the most hopeful and the children in this stage react well to treatment. The methods used in diagnosis are those employed for the later stages of the disease, but the findings indicate a less severe involvement.

**History.** The fact that a child has been exposed to tubercular infection, that other members of the family have suffered from the disease and that proper hygienic conditions have been observed, has a bearing on the diagnosis in this as in other infectious diseases. Tuberculosis is to be suspected when a child does not regain his proper strength after measles, pertussis, bronchitis, pneumonia, grippe or any wasting disease.

Fever is suggestive but not pathognomonic. Nearly every tubercular child shows some fever, usually irregular and fleeting. In cases which show a definite afternoon rise of temperature with morning subnormal temperature tuberculosis is indicated unless some other cause for the temperature variations is evident. The temperature curve may be extremely irregular, varying from day to day; may be more marked on alternate days, suggesting malaria; may be of the stair-case type, suggesting typhoid fever, or may be fairly constant with occasional chilliness, suggesting some pyogenic focus. Fevers may be present during the primary stage, or may not be noted until definite tubercular lesions are present.

The blood continues to show secondary anemia, unless there is considerable coughing. In that case the blood findings may be almost or quite normal. The disproportion between the hyaline and the granular cells persists, and an excess of eosinophiles is almost invariable.

**The secondary stage** is characterized by the development of definitely tubercular lesions. Cough is usually present in pulmonary tuberculosis. A dry, paroxysmal, unproductive and unsatisfactory cough, associated with dyspnea is almost always due to tubercular bronchial lymphatics. Productive cough should give sputum which contains the bacilli of tuberculosis if several examinations are made.

Any chronic cough, not due to other causes, should lead to a suspicion of tuberculosis. Hemoptysis is due to many causes during childhood, and this should suggest tuberculosis only when there is some wasting or malnutrition.

Pleurisy with effusion is nearly always tubercular when it occurs during childhood. Ascites also is usually tubercular when it is found in children; cardiac and renal disease must be excluded before the diagnosis of tuberculosis is made. When masses are found within the abdomen, tubercular peritonitis is the most probable diagnosis.

Tubercular meningitis should be suspected when meningeal symptoms occur in a child which has previously shown some tubercular characteristics, and when there is no epidemic of meningitis. The blood shows marked leukocytosis during meningitis due to tuberculosis but not during other tubercular symptoms.

The X-ray is of value only when a skillful radiologist is consulted. Tubercular foci may be overlooked or other shadows may be misinterpreted by the careless or hasty examination of the plates, or by the examination of plates not properly taken. The X-ray is of most value when the process is located in the bronchial lymph nodes, lungs, pleura, bones and joints. It is of great value in tuberculosis of the vertebrae.

The recognition of the tubercle bacilli is definitely diagnostic. Children usually swallow the sputum and babies always do, so that it is not easy to secure it for examination. The baby may vomit after swallowing the sputum, and the vomitus then may be examined. The spinal fluid contains the bacilli in tubercular meningitis. During intestinal tuberculosis the stools may contain the bacilli, though these are often found with difficulty. The injection of a guinea pig with stools or vomitus may make the diagnosis certain.

The blood changes during the secondary stage, especially if there is coughing or dyspnea. The hemoglobin increases, the erythrocytes attain normal numbers, the color index reaches one, or about one, and the red cells generally show much improvement. The white cells vary according to the location of the tubercular lesion. Meningitis shows a definite leukocytosis, but the eosinophiles are rarely diminished in tuberculosis with secondary pyogenic infection as they are in primary pyogenic cases. If no secondary pyogenic infection occurs, and the meninges are not involved, the blood shows the diminution in the neutrophiles, increase in the eosinophiles and the increase in the hyaline cells that characterize the early stages.

Several tuberculin reactions have been employed in diagnosis. Subcutaneous injections of tuberculin have been made, and when there is a constitutional reaction of fever a tuberculous focus is indicated. This test is not of value when the child has fever, and a



latent tubercular focus may become active as a result of the injection of tuberculin. The test is not now considered justifiable. The intracutaneous test consists in injecting tuberculin into the layers of the skin. This is less dangerous than the subcutaneous injection of tuberculin, but it may light up a latent tubercular focus. Clamette's test is the application of a very small amount of a weak solution of tuberculin into the eye. A conjunctivitis results if there is any tuberculosis in the body. The eye is sometimes seriously injured by the reaction. The test is not now used on that account. Moro's test is less harmful than the others. A mixture of tuberculin and lanolin is rubbed into the skin of the arm. If tuberculosis is present in the body there is an eruption of small red papules in twenty-four to forty-eight hours later. Usually four areas are tested, all in a line upon the inner aspect of the forearm; lanolin alone, old human tuberculin, new human tuberculin and bovine tuberculin. A positive reaction occurs if there is present a small, old tubercular lesion, completely healed and insignificant. Since such lesions are present in a considerable proportion of children as well as adults, the positive reaction has little significance. In infancy the positive reaction indicates a process which is probably active. Occasionally this test lights up an old tubercular process which had been latent or definitely circumscribed.

### **Treatment of Tuberculosis**

The rigidity always present in the lower thoracic spinal column of tubercular individuals must be relieved and such other lesions as may be found should receive suitable attention. The lower thoracic rigidity may or may not be associated with definitely localized lesions of the vertebrae and the corresponding ribs. The thorax is often rather rigid and the ribs more nearly horizontal than is normal for the child of the age of the patient. This condition usually yields to the treatment given for increased flexibility of the thorax. The corrective treatment is extremely important, and children who have failed to improve under the best known hygienic and dietetic conditions often show immediate improvement when the corrective treatment is given also.

Dietetic requirements are also important. The child has usually been eating improperly, most commonly an excess of carbohydrates or a deficiency of fats. Excessive "stuffing" is not now considered advisable for tubercular children. An abundant supply of the raw green vegetables and fresh fruits is always indicated. Even little babies should be given orange, prune or tomato juice, diluted well. The vegetable juices may be added to hot soup, but they must not be all cooked in the soup. Fruit juices may be diluted with cool water, and a small amount of sugar may be added to make the drink palatable. Dried fruits, such as dates, raisins and prunes are palatable and nutritious. Orange juice and tomato juice provides

the vitamins so essential to normal growth; other fruits and vegetables are also abundantly supplied with vitamins. Milk and cream are to be freely given, but too rich milk and too much cream must not be forced upon the child. Ice cream, made under cleanly conditions, may be well taken when other forms of cream are not well digested. The ice cream must be eaten slowly, and none must be swallowed while it is still very cold.

Fats are required by tubercular and pretubercular children in rather greater amounts than by normal children. Cream, ice cream, butter, olive oil and bacon are sources of fat which are usually palatable and well digested. The olive oil is occasionally repugnant, and it need not be forced upon the child if he eats other fatty foods. Olive oil is best taken in the form of salad dressing and it should be made with lemon juice instead of vinegar. No fried foods are permitted, though the child may like them very much. The fats which have been raised to the frying temperature are not wholesome.

Proteid foods are to be given in the amounts proper for the age of the child. Milk and eggs provide protein foods which are usually well handled by these children. The eggs may be made into custard or omelet if they are not palatable as usually served. They must not be fried, but any other mode of preparation is allowable. Milk may be taken sweet, sour, made into buttermilk, junket, or soups with vegetables. A child should take at least a quart of milk and one-fourth pint of cream, or a full quart of milk and a pint of the top from a quart bottle. If he can handle a larger amount this should be given him, but he must not be allowed to take milk instead of other foods. Especially the vegetables and fruits must be given freely, if the child is old enough to handle these foods.

Fresh air is indispensable. The child should be out of doors as much as is possible. A covered sleeping porch is good if the weather is inclement, but if the weather permits it is better if there is no roof over the bed at all. Even in cold weather some method should be employed which permits the child to breathe fresh air all night and all day. The body of the child must be kept warm by the use of light, soft clothing, hot water bottles or electric pads. This warmth must not be secured by means of heavy or too abundant clothing. The wearing of too much clothing is often a cause of lowered resistance.

Change of climate is desirable. If the child has been living at a high altitude, he may be taken to a lower level; if he has been at a low level he may be taken to the mountains or to a high plateau. A dry climate is always better than a damp unless the disease has been contracted in a dry climate. Usually a high altitude is better than a low, and the seashore is not usually so good as the country some distance from the ocean. There are many exceptions to these

statements, and it often happens that a child makes excellent recovery when he is taken from a high, dry, warm climate to a moist beach place.

Wherever he makes the most rapid improvement is best, for a time. If he seems to cease improving for two or three weeks, and no reason for this is evident, another climate may be tried. A difference of a few miles may be all that is required to secure more sunshine, less fog, less winds or the possibility of more outdoor life.

Bathing, hours of sleep, play or exercise should be governed by the condition of the child day by day.

During the fever, if there is fever, he must be kept quiet, and preferably in bed. If the temperature exceeds 100° F. he must be in bed until it diminishes. If the temperature goes below 99° F. he may play around quietly as he chooses, but he must not engage in any strenuous play. If he is too restless in bed he may be given quiet games, or may be allowed up in the room. If the temperature goes below normal, or if it remains normal he may play, run or walk at his choice. Generally speaking, children who are tubercular or pretubercular should be encouraged to choose games which do not require any strenuous effort.

### Prophylaxis

Tubercular persons must not be allowed to come in contact with babies or with children if it is in any way possible to avoid it.

Babies and children should be examined occasionally, and any tendency to lower thoracic rigidity immediately corrected.

Proper food for children is necessary, and no child should be allowed to fall into improper habits of eating.

Excessive clothing is to be avoided. Fresh air is always to be secured for babies and children.

Unless the milk is from a cow known to be perfectly healthy, the milk should be boiled before it is given to a child. In this case the vitamins must be administered in other ways. Orange juice, tomato juice and the juices of other fruits and vegetables may be given in amounts and dilutions suitable to the age of the child.

### Types of Tuberculosis

General tuberculosis is a widespread involvement of several organs, with either many miliary tubercles or several larger masses of confluent tubercles, which occasionally follows a local manifestation of the disease. The liver is more commonly affected in general tuberculosis in children than in general tuberculosis in adults. The tubercles generally are larger and more definitely confluent than under the same circumstances in adults.

### Pulmonary Tuberculosis

Pulmonary tuberculosis is the most common form of the disease. Tubercular bronchopneumonia is the most frequent form found in children, especially in those below school age. The condition may be primary, or may be secondary to tuberculosis elsewhere in the body, most commonly in the bronchial lymph nodes. It may develop from the "pretubercular" stage, with symptoms of tuberculosis in general, or, more commonly, may follow some infectious disease, such as measles, bronchopneumonia, lobar pneumonia, influenza or whooping cough. It often seems to follow repeated attacks of bronchitis, and no doubt in these cases some are really tubercular from the beginning while others are at first bronchitis of the ordinary type with later tubercular infection.

Acute tubercular bronchopneumonia may not be distinguishable from ordinary bronchopneumonia. There may be great daily variation in the temperature, and evidences of toxemia may be less marked in tubercular than in other forms of bronchopneumonia. Recovery is not to be expected, but does occasionally occur.

Subacute tubercular bronchopneumonia most commonly follows measles or some other acute infectious disease. The onset is more gradual than in ordinary bronchopneumonia. Cough, irregular temperature variations and rales may precede the pneumonic symptoms. Evidences of consolidation may lead to an erroneous diagnosis of lobar pneumonia. Moist rales and pleuritic sounds are scattered over all, or nearly all, of the lung areas. The disease may persist for two to four months. Death is due to exhaustion. Recovery may occur, and the convalescence is extremely tedious. At any time miliary tuberculosis may result from scattering of the tubercle bacilli, and death be due to that condition. Secondary anemia is commonly present throughout the disease.

Chronic tubercular bronchopneumonia is more greatly delayed than is the subacute type. Cough, fever variations and anemia are those of the phthisis found in adults. Night sweats may or may not occur. The temperature is variable, and may remain at normal for days at a time. There is emaciation always, and the child is very apparently in a constant decline. Death occurs from exhaustion or from miliary tuberculosis. At almost any time, with proper treatment, the progress of the disease may cease and recovery take place after a prolonged convalescence. Tubercular pleurisy is always associated with tubercular bronchopneumonia.

Miliary pulmonary tuberculosis is characterized by the presence of many small tubercles scattered over and through the lungs. This form is extremely rare before the age of two years. The condition is always secondary. Fever is irregular and not commonly hectic; respiration is very rapid and there are occasional attacks of dyspnea and cyanosis in most cases. The pulse is rapid, prostration marked,



and the cough is frequent and annoying, if not extremely painful. The physical sounds are not at all characteristic, since the pathological processes are widely scattered. The child usually dies from tubercular meningitis, and recovery cannot be hoped for under any circumstances.

Hilus tuberculosis is usually due to an extension of the tubercular process from the tracheo-bronchial lymphatics. The symptoms are indefinite, such as malaise, anorexia, loss of weight and occasionally some afternoon fever of slight degree. The X-ray plate may show fine lines radiating from the root of the lung, but the diagnosis is rarely determined antemortem. The course of the disease is that of tuberculosis of the bronchial lymphatics.

Ghon's tuberculosis (primary pulmonary foci of Ghon). This is a chronic type of tuberculosis, characterized by many small tubercular lesions in the lungs, always small and with rounded outlines. They are somewhat more abundant in the upper lobes of the lung, but may be found anywhere in the lung tissue. They are more common in little children. Two types of termination occur; they may become caseated, fibrous and ultimately harmless, or they may be lightly encapsulated, active, and the cause of later tubercular meningitis, tubercular bronchopneumonia or miliary tuberculosis.

### **Tubercular Adenitis**

Tuberculosis of the lymph nodes or glands (scrofula; tabes mesenterica) is very common during childhood. When the glands of the cavities of the body are affected, the related viscera are usually affected.

Cervical tubercular adenitis (tuberculosis of the glands of the neck) is very frequently found in children who do not display any other symptoms of tuberculosis. This condition was called "scrofula" or "scrofulosis" before the tubercular nature of the inflammation was recognized. Acute infectious diseases (especially measles and whooping cough), adenoids and infected tonsils are the most common predisposing causes. The tonsils are usually tubercular when there are tubercular cervical lymphatics. Less often the infection ascends from tubercular bronchial lymphatics.

The tubercular glands are not usually painful. The presence of small, hard nodules in the neck is the first, and in many cases the only, symptom. These may increase in size and in number until considerable deformity of the neck results. They are not adherent to the skin until further pathological changes occur. In serious cases the glands and neighboring tissues swell greatly, become adherent to the skin, and the gland breaks down. An abscess forms and this usually breaks upon the skin. A sinus may be left which discharges constantly or frequently. The neighboring lymph nodes

are affected, one by one, and the entire process may continue for several years.

At any time the process may cease. The enlarged, hardened nodes may remain for a few years, gradually disappear, and no further symptoms occur. A single node may become swollen, undergo resolution and softening, and not break upon the surface at all. After discharge occurs, the sinus may heal at any time and no further symptoms occur.

Treatment is that of tuberculosis in general. If the abscess points it may be incised and drained.

Tuberculosis of the tracheobronchial lymph nodes is also a very common condition. The lymphatics of the trachea, bronchi and the smaller bronchial tubes are frequently affected together. These tubercular nodes may undergo suppuration in infants, and break into the trachea or a large bronchus and produce asphyxia, or they may perforate one of the large blood vessels and cause death from hemorrhage.

The pressure due to the enlargement of the nodes may affect the trachea or a bronchus, causing dyspnea or suffocation; or they partially or completely occlude the esophagus, by pressure; or they may affect the vagus, causing cardiac irregularities and bronchial asthma, or they may so press upon the recurrent laryngeal nerve as to cause a peculiarly irritating hacking cough with prolonged inspiration resembling that of asthma. Pressure upon the trachea may cause cough which is usually paroxysmal and noisy.

If the enlargement is great and several nodes are affected, there may be an area of dullness noted at about the level of the third to the sixth thoracic spinous processes. If one bronchus is almost or quite occluded, there is diminished resonance upon the affected side. Pectoriloquy below the level of the third thoracic spinous process is probably always due to enlarged bronchial lymphatics.

The X-ray shows the enlargement only when the affected nodes become calcified.

Tuberculosis of the mesenteric nodes (*tabes mesenterica*) may occur alone as a primary affection, may be associated with tuberculosis of the intestines or may be associated with tuberculosis in other parts of the body not including the intestines. In those cases in which the mesenteric nodes and the intestines are both affected, the severity of the pathological changes in the intestines bears no relation to the severity of the lymphatic pathology. Probably the intestinal mucous membrane always presents the point of entry for the infection of the mesenteric lymphatics.

The symptoms are not distinctive and the condition is not often recognized before death. Wasting, anemia, irregular fever and some vague abdominal pain are the symptoms, and these are not

pathognomonic. Tympanites, severe pain in the abdomen and alternating constipation and diarrhea suggest intestinal or peritoneal infection. On palpation the tumors formed by the enlarged nodes may occasionally be felt, but this is usually not possible because the lymph nodes are not greatly enlarged and there is some neighboring edema of the tissues. The abdominal distension and the tympanites also obscure the condition.

There is often an error in differentiating between tubercular inflammation of the lymph nodes near the cecum, and appendicitis.

Generalized tubercular adenitis is rare at any time of life, but is rather more often found among children. It most commonly follows some acute infectious disease, but it occurs in children already tubercular, those who are not known to be tubercular but who are debilitated for any reason, and occasionally the disease appears suddenly in children previously in good health.

The onset is abrupt, with malaise, fever, anorexia and rapid emaciation. The lymph nodes of the neck, axillae, and groin are quickly enlarged to a deforming extent. Death is to be expected within a few months, at most, and it may occur within a few weeks after the first symptoms are noted. Very rarely the child recovers, but only after a long and stormy convalescence.

### Intestinal Tuberculosis

Tuberculosis of the intestine is also fairly common. It is much more often found in children with adenoids and diseased tonsils than among children with unimpeded respiratory tract. In acute miliary tuberculosis the serous surfaces of the intestines are dotted with the miliary tubercles, but this is not the condition found at autopsy in intestinal tuberculosis cases.

The first invasion of the intestines is the appearance of small tubercular foci, miliary in size. These tubercles increase in number and finally coalesce. At first only the mucous epithelium is invaded, but with the growth of the ulcer the deeper layers are progressively involved, and the ulcer may reach the serous surface. As this occurs the tubercular process involves the peritoneum, adhesions are abundant and there are rarely any symptoms of perforation.

Diagnosis is not always possible. In mild cases the ulcers are small and they may cause no symptoms at all. Unless an autopsy is performed there may be no suspicion of tuberculosis. In more severe cases the symptoms are those of recurring ileocolitis. If pulmonary tuberculosis is recognized intestinal tuberculosis may be suspected from the diarrheal symptoms. The stools are more offensive, thinner and more often bloody in tubercular than in other forms of ileocolitis. Abdominal distention and tympanites may be severe, and the pain be almost constant and very annoying. The course of the disease is marked by irregular fever, emaciation, alter-

nating diarrhea and constipation and, later, evidences of general tubercular involvement. The tubercle bacilli may be demonstrated in the stools, most definitely by animal inoculation (usually cavies).

In addition to the usual treatment of tuberculosis, the application of hot flannels, poultices or stupes may be used for the relief of the pain. Opiates may be necessary in severe cases. In severe cases death is almost inevitable. The child may live for several months, with varying fever, attacks of pain, diarrhea and occasionally temporary improvement.

### **Genito-urinary Tuberculosis**

Tuberculosis of the genito-urinary tract is not common among children. The kidney is often affected in general miliary tuberculosis, but no definitely renal symptoms are often found. Tuberculosis of the testes rarely occurs, and even more rarely is there found tuberculosis of the ovaries. Tubercular infection of the wound made by ritual circumcision has been reported.

### **Tubercular Peritonitis**

Tuberculosis accounts for nearly all cases of chronic peritonitis in children. In general tuberculosis the peritoneum is almost invariably affected. Mild cases are recognized only post mortem. Congenital cases have been reported.

Tubercular peritonitis may be the only tubercular focus found in the body, though it is probable that some small lesion of the intestines or the lungs permitted the entry of the bacteria.

At first there are small tubercles upon the surface of the peritoneum. These disappear with recovery. If the condition persists they increase in size and in numbers and become confluent. The peritoneum becomes adherent in many areas, and the folds may be filled with various accumulations of serum, blood, fibrous exudate and caseous material. The serous fluid may be most abundant, in which ascites may be severe. The ascitic fluid always contains the bacteria, though they may not be easily found. Animal inoculation, however, always shows that the fluid contains the bacillus of tuberculosis. Fibrinous exudate may be in excess, in which case the adhesions are very thick and tough. The exudate may become infected with pyogenic bacteria, in which case a large amount of pus may be formed, and this may drain upon the abdominal wall, preferably at the navel, or it may burrow into the intestine.

The symptoms vary to some extent according to the nature of the processes.

Ascitic tubercular peritonitis begins insidiously. Vomiting, diarrhea or constipation may be present, and there may be some abdominal discomfort and a slight, irregular fever. These are not indicative of any form of tuberculosis. Distention of the abdomen



is the first definite symptom, and there may be tympany for some time before the fluid is recognizable. Later there is a fluctuating dullness which appears in the flanks and which changes with the position of the child. The abdominal veins become dilated and the umbilicus shows some pouting. The thickened omentum or the enlarged lymph nodes may, rarely, be palpated.

The inflammation may show marked symptoms rather suddenly, and these may lead to an erroneous diagnosis of appendicitis. This is the more apt to occur because the peritoneum near the cecum is often the first and most seriously inflamed area. Paracentesis for the ascites brings a fluid, often bloody and sometimes purulent, which contains the bacilli of tuberculosis. These may not be found on microscopic examination, but can be demonstrated by the inoculation of a cavity with the ascitic fluid.

The fibrinous form is more common than the ascitic. The onset is very gradual, with vague symptoms of vomiting, diarrhea, abdominal discomfort and, very rarely, some irregular feverishness. Palpation may disclose a thickened, nodular omentum with an irregular lumpy feeling of the bowels. The abdomen may seem globular, as in ascites, but is more often of irregularly enlarged contour. The fibrinous form may be present from the beginning or it may follow the ascitic form.

Ulcerative (caseous) tubercular peritonitis may follow the fibrinous form, or it may be present from the onset. Large tubercular nodules undergo caseation and may become purulent. Tuberculosis is always present in other tissues of the body, and there is little doubt of the diagnosis. Abdominal pain and tenderness, diarrhea, emaciation, high fever, and weakness are progressive, usually rapidly. There is little hope of continued life for the child in this form of tubercular peritonitis. The fibrous form may terminate in recovery, though several years are affected by the disease. Adhesions are usually abundantly present, and the intestinal disorders resulting from the adhesions may cause much discomfort during later life. The ascitic form is least severe. It may remain moderately severe for a few months, and then terminate in a rather protracted convalescence. Adhesions are usually less abundant and less firm than in the adhesive form of the disease.

In addition to the usual treatment for tuberculosis, the abdomen should be exposed to the sunshine daily. The first day the abdomen should be exposed to the sun for two minutes, once. The next day the abdomen may be exposed for two minutes, twice during the day. The next day, three minutes, twice during the day, and after that one minute may be added to the time of exposure each day until the fifth day. Three minutes each day can then be added until the skin of the abdomen is exposed to the sunshine for half an hour or an hour, twice each day.

Operative treatment is often very successful. The ascitic fluid can be drained by paracentesis, but it is much better if the air is permitted to enter the abdomen freely. The exposure of the peritoneum to the air is helpful in fibrinous tubercular peritonitis also. In the ulcerative type masses of pus and caseous material can be removed and the air permitted to enter the peritoneum, and this exercises a distinctly remediable effect.

### **Tubercular Meningitis**

Leptomeningitis is more often tubercular than otherwise, except during an epidemic of cerebrospinal fever. Trauma of the head, lesions of the cervical vertebrae and the occiput and a neuropathic constitution tend to encourage the infection of the meninges when the tubercle bacilli are present in the body or in the inspired air. The disease is most abundant between the second and the fourth years.

The tubercle causes slightly different pathological changes in this disease. At first there are many definite small tubercles. Later there is an exudate, grayish in color, and rather sticky, which covers over the meninges. The cerebrospinal fluid is increased, though not to so great an extent as in other types of meningitis. The dura is tense, from the amount of fluid beneath it. The ventricles are dilated with the pressure of the increased fluid. Small tubercles may be found upon any area of the meninges and within the ventricles. The pia of the upper part of the spinal cord is usually somewhat involved. Obliterating endarteritis and phlebitis are often found. The membrane of the base of the brain may be only slightly thickened, with a thin grayish exudate, or there may be an abundant thick, gelatinous exudate. The brain itself is involved in an encephalitis, and occasionally there may be tubercles upon the brain itself. Tubercular meningitis is very often associated with a general miliary tuberculosis, though this is not always the case. It may be impossible, until an autopsy, to find any tubercular lesions except those of the meninges.

Diagnosis is not easy. If other tubercular foci are not present it may be impossible to determine that the meningitis is tubercular. The progress of the disease is slower than in other forms of meningitis, but this is not constant.

The symptoms are those of any acute meningitis. The onset may be gradual, with irritability, fretfulness, drowsiness, vomiting and headache, or it may, especially in babies, be very sudden with fever, vomiting and indications of extreme illness.

These indeterminate symptoms may persist for a week or only for a few days. The sleep is often disturbed by a loud cry, and the child often grinds his teeth during his sleep. During the day he is drowsy and when he seems conscious he may be delirious and is

always very fretful and uncomfortable. He lies with the eyes half open, apparently looking at some distant object. Babies show bulging fontanelles, vomit frequently in most cases, and they may have several convulsions. Rigidity of the neck and the back, opisthotonos, hyperesthesia, photophobia, twitchings of the muscles and sudden loud cries at night are symptoms of meningitis but they do not suggest tubercular rather than any other infectious agent. There is a tendency to assume the "gun-hammer" position; the head is thrown backward, the back arched and the thighs are flexed strongly upon the abdomen while the arms are flexed at the elbows and held firmly to the sides of the thorax. In other cases the child lies rigidly upon the back with the head turned to one side and the arms firmly extended along the sides of the body. The abdomen is scaphoid in all cases. The eyes may be turned to one side or rolled in some odd manner, or there may be nystagmus. The pupils may be contracted or may remain normal. An occasional attack of vomiting, occasionally projectile, may occur. A flushing of certain areas of the skin may follow exposure to cold, and there may be irregular and apparently causeless flushings of the face (*tache cerebrale*). Reflexes are exaggerated and there may be fever to 102° F. or more.

These symptoms increase in severity after a few days or perhaps a fortnight, and the paralytic stage begins. The muscles of the body and limbs are paralyzed; the child is in a coma; the temperature may reach 104° F. or more; the reflexes are absent; the cornea is insensitive to touch; the breathing and pulse are very irregular and Cheyne-Stokes respirations commonly occur. Death commonly occurs quietly during coma, but occasionally convulsions immediately precede death.

The blood in tubercular meningitis shows leukocytosis and secondary anemia. The increased leukocyte is partly due to an increase in the number of small hyaline cells. The very high leukocyte counts of epidemic meningitis are not found in tubercular meningitis; rarely are more than 20,000 leukocytes found per cubic millimeter.

The spinal fluid is under high pressure, sometimes to 50 mm. of mercury. It is usually clear, but may show slight cloudiness. The specific gravity is about 1010, and 100 or 200 leukocytes may be found per cubic millimeter. These may be mononuclear or polymorphonuclear. Tubercle bacilli may be found, or it may not be possible to find any. The coagulum resulting from spontaneous coagulation of the spinal fluid usually includes the bacilli in its meshes. If coagulation does not occur, the spinal fluid should be centrifuged and the sediment examined. If no tubercle bacilli are found, two or three cubic centimeters should be injected into the peritoneal cavity of a cavy.

Treatment is not very successful. The child should be kept from

lying upon the back, if this can be done without causing discomfort to him. A water-bed or an air mattress should be provided. The room must be kept darkened and quiet.

Repeated lumbar puncture may give relief to the nervous symptoms. An ice cap to the head may also give some comfort. Inhibition of the spinal centers may give relief, but usually the spinal centers are so irritable that it is not possible to secure any definite results. After recovery from the meningitis, when this does occur, the treatment for tuberculosis is indicated.

Intermissions frequently occur. The child may seem to be making an excellent recovery, and this good health may persist for several weeks, or even several months. Relapse follows, and death usually follows within a week or two.

The course of the attack is somewhat more slow than in other forms of meningitis; the disease may persist for four or five weeks. If the child recovers the paralysis disappears, and no evil after effects are to be expected, except that there is almost certainly a persistent and widespread tubercular infection which is apt to be fatal ultimately. Nearly all cases are fatal.

Tuberculous tumors of the brain are much more common during childhood than they are in later life. Usually they are multiple, and are secondary to other tubercular foci in the body. The tumor varies from those the size of a pea to those an inch or more in diameter. The neighboring meninges are almost invariably affected also. The cerebellum pons, crura cerebri, basal ganglia and cerebral cortex are most often affected, in the order named. The symptoms vary according to the location of the tubercle, as in other brain tumors.

Hydrocephalus may be tubercular; this disease is discussed elsewhere.

### **Tuberculosis of the Bones and Joints**

During childhood tuberculosis of the bones and joints is fairly common. The bones are affected from some other tuberculous process, usually by way of the blood from the bronchial lymph nodes. The joints are affected as the result of the disease of the bones. Trauma plays an important part in etiology.

The vertebrae and the hip joint are most commonly affected, but almost any bone may be the seat of tuberculosis. The lower extremities are much more often affected, probably on account of the greater frequency of trauma in the lower limbs.

The tissue changes are somewhat different from those occurring in other tissues invaded by the bacillus of tuberculosis. There is first a congestion, then infiltration of the cancellous portion of the bone by small hyaline cells. This is followed by the development of small tubercles and these ultimately become caseous and cavities



are formed within the bone. Bits of the bone may be surrounded by the tubercular process and these bits of dead bone act as further irritants.

At any time there may be a connective tissue reproduction around the pathological processes which are thus encapsulated. The extension of the disease thus is prevented. Within the capsule the bacteria die from the lack of food stuffs and the accumulation of their own metabolic products, the tissue may become calcified and inactive, or there may be secondary infection with any of the pyogenic bacteria, pus be formed and the abscess ultimately drain into the surrounding tissues or upon the surface of the body. Quiescent tubercular areas in the bone are liable to break out into increased activity at almost any injury of the affected bone, even after years of apparently no active tubercular processes.

### **Tuberculous Dactylitis**

(Spina Ventosa)

This disease is a tubercular inflammation of the phalanges or the metacarpal bones, most commonly of the hands. The index finger is the most common seat of this type of inflammation. The central areas undergo the usual tubercular changes, the hard periphery of the bone is thinned and the periosteum becomes swollen and congested; the soft tissues share in the inflammatory process and abscess formation is frequent. The finger becomes spindle-shaped, enlarged and red, but there is little or no pain at any time.

Tuberculous is distinguished from syphilitic dactylitis in the fact that tubercular dactylitis is not symmetrical but affects one hand or one foot only; there are no syphilitic evidences elsewhere in the body; the child is of the runabout age or older and usually shows other evidences of tuberculosis. Syphilitic dactylitis occurs in babies, is symmetrical and usually multiple; other evidences of syphilis are almost invariably to be found and the child is not usually tubercular.

If abscess develops, the pus should be evacuated and any pieces of dead bone removed. The usual treatment for tuberculosis is indicated.

### **Tuberculous Spondylitis**

(Pott's Disease; Caries of the Spine)

This disease is more common between the ages of one and fourteen years. Many cases begin during the second to the fourth year of life. The disease begins as a tuberculous inflammation of the perisoteum, then of the bone, of the body, of a vertebrae. Usually two adjacent edges of these are affected almost or quite simultaneously. This invasion of the body goes on until the body becomes greatly weakened and gives way to the pressure upon it. An angu-

lar deformity of the spinal column is thus produced. When several vertebrae are affected at about the same time there may be a curving rather than an angular deformity. The spinous processes and the arches are not affected by the inflammatory process. At any time the tubercular process may cease, ankylosis occur in the surrounding tissues and the deformity remain unchanged through the rest of the life of the child. In occasional cases the tubercular process invades neighboring soft tissues and a burrowing abscess is formed.

The onset is very gradual, without recognizable symptoms. Restlessness, fretfulness and pain in the back are noted finally; the pain is much more severe when the child jumps or runs, but pressure upon the painful area does not cause pain. Muscular rigidity is marked over the affected part of the spine, and the child assumes various positions which seem most comfortable to him. He also begins to "save himself" by the manner in which he moves. If he wishes to pick up an article from the floor he flexes the knees but does not bend the back. He may arise from the floor by "climbing himself", placing first one hand then the other upon his legs, knees, thighs and hips, thus bringing himself erect without any painful flexion of the spinal column. He may walk upon his toes to prevent painful jarring of his back; he is apt to rest himself by hanging with the shoulders upon a fence, a window seat or a high shelf. He lies upon his stomach in bed, or props pillows under the aching back.

When the tubercular area is in the thoracic region he may support himself by placing his hands upon his hips, or when the cervical vertebrae are affected he may support his head on his hands. When the deformity is so great that pressure is produced upon the spinal cord, compression myelitis (q.v.) is produced.

If the process does not stop before myelitis occurs, about three years after the first recognizable deformity, paraplegia appears. Kyphosis is most marked when the mid-thoracic spinal region is affected; the thorax becomes flattened at the sides, the lower ribs droop greatly and the sternum becomes elevated with a comparatively elevated position of the upper ribs.

Abscesses develop in about one case in three. This "cold abscess" develops without causing any recognizable symptoms at first, but when it attains a certain size there may be some dull aching and some pressure symptoms. When the abscess results from cervical caries, it is apt to open into the esophagus (retropharyngeal abscess, q.v.) or it may burrow forward and open upon the surface of the neck, above the clavicle. When the abscess arises from the upper thoracic or the lower cervical vertebrae, it may drain into the pleural cavity or may work its way into the scapular region and drain from beneath its lower edge. In other cases this

abscess gravitates to the lower part of the body and drains just above Poupart's ligament. Lumbar caries is most often associated with abscess, and this drains upon the surface at Poupart's ligament, in the loin or in the thigh.

The course of the disease is prolonged, with little or no fever, no emaciation, no constitutional symptoms and little discomfort. These children often grow into men and women of physical health and mental vigor, and still a tubercular abscess may drain occasionally year after year.

The spinal deformity increases as successive vertebral bodies are affected until the arches and the spinous processes and ligaments prevent further approximation of the bodies of the vertebrae. Ankylosis follows the diseased process from the beginning and when no further deformity is caused, when the bodies cannot be further approximated, the tubercular process ceases, usually about five years after the first symptoms. Even those cases associated with paraplegia before the termination of the inflammatory processes, may regain complete control of the leg muscles. Probably this is due chiefly to the absorption of the inflammatory exudate, after the active process has ceased.

If the ankylosis should be broken up, as by accidental trauma or in an effort to make the back straight, the bacteria usually become active, there is abscess formation with renewed malignancy, miliary tuberculosis usually develops and the patient usually dies from general tuberculosis. Occasionally the back remains straight after such an injury, the patient recovers from the tubercular processes if they do occur, and he becomes straight and fairly well.

**Treatment.** In addition to the treatment for tuberculosis, the support of the spinal column becomes necessary. At first it is best to place him in a frame of some sort, and let him stay in bed until the active inflammation has ceased. Then he may have a supporting frame or jacket and walk around. Many orthopedic surgeons provide the supporting and extending frame at once, and allow the child to be up from the beginning. Even then, he should be made to rest several times each day, lying flat in bed for ten or fifteen minutes. No matter what the mechanical treatment, the back must be well supported, pressure kept from the diseased vertebrae and no fatigue of any kind permitted. Fresh air is not less necessary for the tubercular spine than it is for tubercular lungs. Exposure of the back to the rays of the sun is helpful. The first day the child should lie in the sunshine with the back bare for two minutes. The next day he may have the direct sunshine for two minutes, once in the morning and again in the afternoon. The time may be gradually extended, avoiding sunburn, until he can spend an hour or more every day with the sun shining upon the back. The sunshine upon the entire body is good, too. If the sun is very hot, the head

should always be shaded and kept cool, if necessary, by an ice bag.

With proper support, the back should become ankylotic with only slight deformity. The deformity ought not to be recognizable after the child has been dressed, if the treatment has been begun before the disease has been long present.

The prognosis is good for life, although the disease is by no means negligible. Many of these children suffer from constant abscess formation and drainage and finally die from exhaustion. After ankylosis, the children are less vigorous than they should be, they suffer greatly from any cause of ill health, they may die from acute infectious disease, and they may have an extension of the disease and the development of general tuberculosis at any time.

### **Tuberculous Arthritis**

Arthritis is tubercular primarily only in a small proportion of the cases. Generally the tubercular process begins in the end of the bone, and invades the joint secondarily. The first symptoms are often due to joint involvement, since the process causes little or no disturbance as long as the process is limited to a small area of the bone itself.

The hip-joint is by far the most common site of tuberculous arthritis; the knee next frequently, and then the ankle, elbow, and other joints of the body. The process begins most commonly in the condyles of the femur when the knee is involved, and less often in the upper end of the tibia. When the ankle is involved, the tarsal bones are first tubercular in most cases, but occasionally the lower end of the tibia presents the first inflammatory changes. The lower end of the humerus is commonly the first site of inflammation when the elbow is affected, and occasionally the tuberculous process begins in the upper end of the radius. In all these joints the synovial membrane is first affected in a small proportion of cases.

The onset is slow and gradual. Pain may be severe at intervals, or it may be absent, or there may be occasional or constant dull aching in the region of the joint. Later pain is constant, and may be severe. The muscles which move the joint are always rigid, the joint is swollen and held fixed in a flexed or semi-flexed position. Atrophy of the muscles follows. When suppuration occurs there may be high fever and marked leukocytosis.

Tuberculous arthritis of the knee (white swelling) is characterized first by the swelling, persistent slight flexion of the knee, and limping. When the ankle is affected there is some limping, the leg is partially abducted and the foot is everted and rotated outwardly. When the elbow is affected there is pronation with slight flexion of the elbow. The disease of the hip requires more extended discussion.



Treatment includes the treatment for tuberculosis in general, complete rest for the affected joint and the evacuation of the pus and removal of dead fragments of bone when necessary.

The prognosis for life is good, in all the joints except the hip. The affected joint usually becomes ankylosed, though by correct care in mild cases complete recovery may be secured, with good mobility of the joint. Death may result from tuberculosis elsewhere in the body.

### **Hip-Joint Disease**

(Tuberculous Coxitis)

Nearly all cases of hip-joint disease occur before the age of ten years. The disease is about as frequent as is spinal caries. One hip alone is affected in nearly all cases, and if both hips are affected one precedes the other in disease by a year or more.

Nearly always the tubercular process begins in the bone of the femur and later extends to the hip-joint. This is involved in its entire extent, and abscess forms, the head of the femur is destroyed, the bones become displaced and the joint ankylosed. In a few cases the synovial membrane of the joint itself is first affected and the process ultimately invades the head of the femur, deformity and abscesses are produced and the ultimate state is the same as in the more frequent primary involvement of the bone. At any time, the disease process may cease and no further deformity or destruction occur.

The onset is gradual. A slight lameness is first noted, and the child often complains of pain in the knee or the outer side of the thigh. The lameness and the pain may occur at long intervals, or there may be some constant discomfort. The child stands upon the normal leg, and the other leg is rotated outward and usually abducted. The gluteal folds are flattened upon the diseased side, and the internatal crease is deviated toward the normal leg. When the child is placed upon the treating table the diseased leg seems to be longer than the normal leg. The pelvis is found normal, in most cases, but there may have been an innominate or a lumbo-sacral lesion before the infection of the joint. Careful measurements are necessary in making a diagnosis. There is muscular rigidity about the affected hip, though this may not be easily determined. Swelling of the tissues around the joint is usually discernible at an early stage of the disease, if the examination is carefully made. When the child lies upon the back with the legs extended, it is noticed that when the leg is flat upon the table the back is arched, showing that a slight flexion of the thigh is fixed.

As the diseased condition increases the pain becomes severe, so that the child makes no effort to walk or to stand, and he cries when any attempt at motion is made. During the night he starts

and cries from the pain of the involuntary movement of the inflamed hip. The thigh is kept flexed and rotated outward, with the knee flexed and the foot somewhat extended. When the child is then placed upon the table the affected leg seems much shorter than the other on account of the tilting of the pelvis. The leg and thigh soon show decided atrophy. The abscess formed within the joint most frequently drains upon the anterior aspect of the thigh or in the groin near the affected joint. Occasionally the head and the neck of the femur are destroyed and the products of degeneration absorbed and carried away by the lymph and the blood. The affected leg is shortened by several inches, finally, as the line from the anterior superior spine of the ilium to the external malleolus of the two sides is compared.

Constitutional symptoms are variable, but not usually severe. The pain causes restlessness and fretfulness. An evening fever or feverishness is common. With the development of the abscess there may be sharp fever, and this diminishes or disappears when the abscess drains.

Treatment includes the treatment for tuberculosis, plus the measures required for securing complete rest of the hip-joint. Different orthopedic surgeons employ rest in bed, the use of a framework which supports the body and removes the weight and strain from the diseased joint, and various other measures, all of which have the rest of the joint and the improvement of the physical vigor of the child as the chief end to be attained.

## CHAPTER XCI

### SYPHILIS IN CHILDHOOD

Ann E. Perry, D.O. and Dr. Whiting

Syphilis is a communicable infectious disease, due to the *spirocheta pallidum*. In acquired syphilis the organism is found in the primary sore, in the mucous patches and the infected lymph nodes. In congenital syphilis the organism is found in the cutaneous lesions, the fissures around the mouth and elsewhere and in the mucous patches. The liver and the kidneys contain the spirochetes in great numbers, in the fetus dead of syphilis; and all viscera contain a few, but when the child lives even for a few weeks, it is very difficult to find them in any viscus.

It now seems probable that the term "hereditary" syphilis is a misnomer, and that syphilis is either congenital or acquired. The non-syphilitic mother does not bear a syphilitic child, but the symptoms of syphilis are latent if she is infected at about the time she becomes pregnant.

If the parents are healthy at the time of conception, but the mother contracts syphilis during her pregnancy, the child may be affected or may escape. If the mother has secondary symptoms at the time of conception, the child is almost certain to suffer from syphilis severely. When both parents are syphilitic at the time of conception, the child is usually syphilitic, but even then a few children escape infection. If both parents or either parent suffer from tertiary symptoms the child is not usually syphilitic.

The *spirocheta pallida* is a protozoan, a delicate, threadlike organism, with rigid cork-screw convolutions. It tapers to a dull point at each end, and varies in length from four to fourteen microns.

In fresh specimens the organism is very motile, twisting in the longitudinal axis backward and forward. Several methods of staining can be used, or the spirochetes may be viewed while still living by means of a dark stage.

The organism is transmitted to the embryo or the fetus by way of the placenta, which is itself infected. The mother may show no syphilitic lesions, but her blood always gives a strongly positive Wassermann.

#### Fetal Syphilis

The *spirocheta* finds the defenceless fetus a rich soil. In very severe cases, the body is literally choked with the organisms. The inevitable result is abortion of a dead and macerated fetus. In fact, wherever there is a macerated fetus in a spontaneous abortion,

syphilis is suspected, and wherever there is a history of repeated abortions syphilis is a common cause.

There are as a rule no skin lesions in the fetus. Occasionally a syphilitic child will be born with syphilitic pemphigus, but this is the only lesion of the skin. All other skin lesions appear after birth. The reason for this is the fact that the internal organs of the fetus are very vascular, and are rapidly developing while the glands of the skin are retarded in their growth normally, hence the spirochetæ attack the organs first, with such tragic results.

### Infantile Syphilis

The infant with congenital syphilis will show symptoms immediately after birth or within the first weeks after birth. Sometimes the symptoms are delayed to the second month, but this is rare.

**Diagnosis.** There are three symptoms that are nearly always present in the syphilitic new-born, any and all of which are so significant as to suggest syphilis if indeed they are not actually diagnostic of syphilis. They are (1) Coryza; (2) Pustula eruption of the hands and feet (pemphigus); and (3) Enlargement of the spleen.

Coryza is a peculiar snuffling that produces in a few days a whitish foamy mucous sometimes blood flecked. It is persistent over a long period.

Pemphigus is diagnostic of syphilis and is always accompanied by an enlargement of the spleen. The lesion consists of vesicles from the size of a pea to that of a small walnut, rising from an inflamed base. The contents are at first serous, then cloudy, then purulent and are full of spirochetæ.

The enlarged spleen is always suggestive of syphilis. It is not always apparent clinically, but when it is present there are always plenty of other symptoms upon which to base a diagnosis.

### Lesions of Syphilis in the Infant

**Eruption.** The eruption may appear at the same time as the coryza or it may follow in about one week. It is usually macular, about the size of an infant's finger nail. Color, red. It is located upon the face, extensor surfaces of arms and legs and on the hands and feet. Usually absent from the chest and abdomen. Its duration is three to eight weeks. It fades out, leaving a coppery hue of the spots that were reddish.

### Types of Eruption

- (a) Rash. Rare. Appears as a fine diffuse blush that fades to a coppery color that lasts a long time.
- (b) Macular, most frequent form.



- (c) Papular, sometimes occurs along with the macular as hard nodules on the soles.
- (d) Squamous. This frequently comes on the palms and soles, but nowhere else.

Fissures are the most diagnostic lesions. They are located on the lips and anus.

Fissures are really linear ulcers and are very persistent. They are multiple, deep and painful. They bleed easily and when they heal they leave the deformity known as purse string.

Mucous patches may be derived from fissures but usually come from papsules in a location subject to moisture and friction. They are one-eighth to one-half inch in diameter, whitish, slightly raised and are found on the lips, anus, scrotum, vulva, folds of the groin, axillae and buttocks.

Ulcers may result from them in any of these places.

Bleeding takes place from any skin or mucous membrane lesion very easily. Mucous membrane of the nose is particularly susceptible. Internal bleeding is frequent, showing up in large patches when close to the surface.

Suppuration of the nail bed and exfoliation of the nail itself is common.

The nails are sometimes raised in the center as if pinched up from the outside edges. Called claw nail.

The hair comes off in patches and sometimes the whole anterior half of the head, and looks as if shaved.

Pseudoparalysis is due to epiphysitis and it may be the first symptom that draws the attention to the fact that the child is diseased. At the age of a few weeks it is noticed that one or more limbs are not being moved; they are tender upon handling and swelling is marked at the ends of the long bones affected.

Syphilitic osteoperiostitis chiefly affects the long bones and is found in infancy only as a result of a very severe infection. The lesions are usually multiple and symmetrical and chiefly periosteal.

Syphilitic dactylitis is a form of osteoperiostitis wherein the bone is more severely involved than the periosteum. It must be differentiated from tuberculosis but it appears infrequently and when it does there are usually other symptoms that make the diagnosis.

The only lymph nodes that help in a diagnosis are the epitrochlear nodes. If they are enlarged in the infant without other causes syphilis should always be suspected.

The only visceral symptoms of importance are the enlargement of the spleen, and jaundice with or without liver enlargement.

**Prognosis** of the individual depends upon the severity of the infection, age at which the first symptoms appeared, time at which treatment was begun and the thoroughness of the treatment.

The nourishment and environment of the child have a great influence upon the prognosis.

If proper treatment is given the infant he is very likely to lose all symptoms and will not have a recurrence until about the age of seven years and again at puberty.

**The Wasserman reaction.** The Wasserman is used to govern the treatment. The Wasserman is useful and reliable if it be remembered that only four plus positive is diagnostic of syphilis in the untreated case. Treated cases will show up differently. In the untreated case wherever the Wasserman shows a positive less than a four plus, it may be due to several other diseases, and is not a diagnostic sign of syphilis.

The new-born syphilitic will sometimes show a negative Wasserman during the first few weeks of life.

**Late hereditary syphilis.** The entire clinical picture in late congenital syphilis depends upon gummata.

Gummatous proliferations are found in the bones, periosteum, bone-marrow, skin, mucous membrane, brain, liver, spleen and lymph nodes.

These gumma are exactly similar to the tertiary lesions of acquired syphilis.

Gummata of the bones usually choose the tibia, cranium and sternum. They are at first soft, they soon harden and break down easily into deep, obstinate ulcers.

The hyperplastic periostitis of the diaphysis of the tibia is a frequent, very typical and quite a pathognomonic symptom of this period. The overlying skin is thickened, shiny, tense and slightly reddened. Upon palpation, which may not be painful, it feels like a solid spindle-shaped tumor. Sometimes the edge is roughened by indentations and sometimes rounded off.

Gummata of the bone have their origin in the periosteum and not in the bone itself. Those in the hard palate and nasal septum are usually in the bone marrow from which they proliferate, leaving deep erosions and cavities.

Saddle nose of children usually comes from the infantile lues and not from the late form.

Gummata in the throat look not unlike diphtheria. They infect the tonsils and break down into deep vicious ulcers.

Gummata of the skin rise from the subcutaneous cellular tissue. They readily break down into ulcers similar to those in the infantile form.

**Gummata of the viscera.** The liver is most frequently affected with the spleen usually accompanying it.

Brain gummata are rare. When present they are circumscribed. They result at first in severe headaches chiefly at night, later, in attacks of epilepsy and paralyses.

Keratitis is frequent at this period, though not considered a pathognomonic sign. It is often accompanied by deafness and the Hutchinson teeth. When seen all together the above is called the Hutchinson triad and is considered diagnostic.

Hutchinson teeth, so-called, for the man who first described them, are the two upper incisors. They have one indentation in the cutting edge and the posterior side is rounded.

### Ulcers

A typical syphilitic ulcer is rounded, thickened, with indurated borders and a depressed base. The ulcer appears to be scooped out. Leaves a smooth, white scar.

Tubercular ulcers, from which the syphilitic ulcer must be differentiated, has soft, flat edges, is not so deep, and the outline is more irregular. It leaves a purplish scar that fades to red, then to white. The bacilli are present.

### THE SYPHILITIC CHILD

The baby may seem to be perfectly healthy at birth. After a few days a persistent coryza appears with snuffling. The baby cries a great deal, especially during the night, and the voice is hoarse and miserable. Fever and typical eruptions of the skin follow. Inflammations of the bones and joints, or paralysis from cerebral lesions may precede or follow the cutaneous symptoms.

**The eruption** in severe cases (pemphigus neonatorum syphiliticus) is bullous with bloody or purulent contents. The palms and soles are most severely affected; in some cases these alone are affected. Extensive exfoliation is very common. These lesions are not compatible with continued life.

In milder cases the eruption does not occur until some days or weeks after birth. The circumscribed eruption resembles that of adults with acquired syphilis. It usually consists of small macules, slightly elevated with many papules intervening, and most abundant upon the lower limbs, face, scalp, neck, flexor surfaces of the arms, and the palms and soles, in order. Scaling is common. Itching and pain are absent. Absorption may occur in the center, and this causes an annular appearance. Flattened elevations with a moist surface are not uncommon, the "moist condylomata" or mucous patch, most common about the mouth, anus and genitals. These are especially common in the relapses. Papular eruptions of brownish red color are found upon the palms and soles in some cases. The papules may become pustular and this condition may terminate in ulcers or in ecthymatous lesions of the skin. The roseola which is

characteristic of acquired syphilis is not found in congenital cases. All of these lesions may present a yellowish, brownish, coppery or reddish tint, varying with the age of the lesion. The diffuse eruption of congenital syphilis is not present in the acquired type. The skin shows a diffuse thickening, affecting most commonly the palms, soles, scalp, face, genital and anal areas and the flexor surfaces of the thighs. The surface of the skin is shiny, with a coppery or brownish or yellowish tint. Desquamation may be slight, very marked or absent. Inflammation and crust formation may occur and thus the condition resembles eczema. It differs from eczema in the stiffness of the skin and the peculiar tinting.

Fissures of the skin occur in many cases. They are most abundant around the mouth, eyelids, nasal alae and anus, and are narrow, deep, painful, often bleeding and occasionally with crusts; they often leave peculiar linear scars. Syphilitic paronychia and syphilitic alopecia are common results of congenital syphilis.

The mucous membranes show typical changes. The "snuffles" is due to swelling of the mucous membrane of the nose. Respiration may be difficult on account of the swelling and nursing may be often interrupted by the need for mouth breathing. The mouth is made dry by breathing through it. Hoarseness is very common; it is due to edema of the laryngeal tissues.

The lymphoid tissues may show hyperplasia. The spleen is almost invariably enlarged, and this may be the first symptom noted. Syphilitic lymph nodes are enlarged, hard and show no tendency to suppurate.

The teeth are erupted late, and may show various defects. They usually decay early. Hutchinson teeth may be due to syphilis or to other severe malnutrition during infancy.

**Visceral lesions** are more severe in babies born dead or those who die in early infancy. The liver is enlarged and ascites and jaundice are common. Hydrocephalus is common. Spirochetes may be found in almost every organ examined in babies born dead from syphilis, and the kidneys show them very abundantly when the tissue is properly stained.

Nutrition is always greatly affected. Secondary anemia, wasting, marantic symptoms, a general trophy without recognizable cause are all very frequently noted, and debility may be the only recognizable cause of death.

**Syphilitic osteochondritis** is a common skeletal condition in babies with congenital syphilis. The abnormality begins before birth but there may be no manifestation at the time the baby is born. At first a swelling, very tender and painful, begins at the junction of the epiphysis and the shaft of the bone. Complete epiphyseal separation may follow and complete loss of power (syph-



ilitic pseudoparalysis) is a frequent result. The paralytic symptoms are due to pain, and not to any loss of muscular strength. Craniotabes are common. These are thin, softened areas in the skull, most frequently found on the occipital bones; they are due to rickets as well as to syphilis.

Flattening of the bridge of the nose (saddle nose) is a frequent deformity due to congenital syphilis. At birth the flattening is apparently slight, but there is an actual involvement of the bones and cartilages, so that as the child grows the deformity seems to increase.

**Syphilitic dactylitis** is not common. The condition resembles tubercular dactylitis (q.v.) except that it is often multiple and symmetrical, and is associated with syphilitic symptoms elsewhere.

**Syphilitic osteoperiostitis** occasionally occurs during infancy, but is more often first seen during later childhood. The bones undergo great thickening and some lengthening. Nodules may grow upon the bones, and gummata are found beneath the periosteum and within the bones. The shaft of the tibia, the bones of the arms and the skull bones may be affected in this way. The affected bones are usually symmetrical. Necrosis and suppuration may follow the destructive processes of the gummata.

The tibiae, which are most frequently affected, become thickened and bowed anteriorly; the anterior edge may be greatly thinned (sabre tibia) and fractures are caused by comparatively slight trauma. The bones become nodular from the frequent exostoses. Suppuration may occur. The sinuses formed by suppuration heal with great difficulty and the discharge persists for a long time, with the occasional elimination of small masses of diseased and softened bone. At any time the process may cease, the sinus heal, and only the deformity remain to suggest the syphilitic inflammation.

**Deafness** due to syphilis may occur in late childhood. There may be no recognizable cause for the deafness, except that the lesions due to syphilis are commonly found elsewhere in the body.

**Choroiditis** is common in syphilitic babies or children. The retina often shows small areas scattered over it, most abundantly near the yellow spot, in which there is a reddish or yellowish color with granules of dark pigment. The optic nerve is not often affected, and vision is not commonly affected. In the occasional cases of visual defect, the mental state is usually subnormal.

**Neurosyphilis** in children has been considered rare, but studies made during recent years indicate that many atypical nervous symptoms are due to this infection. The spinal fluid gives a positive Wassermann in syphilitic babies after they are three months old. Excess of hyaline cells in the spinal fluid, an increase in the globulin

and a positive colloidal-gold reaction all indicate the effects produced by the treponema.

Meningitis is suggested by opisthotonos or rigidity of the neck and back, by a positive Kernig's sign, and by occasional convulsions. These meningeal symptoms are not acute and are not associated with fever. Hydrocephalus may be due to syphilis.

Endarteritis is common, and this affects the central nervous system most seriously.

Gummata in the cranial cavity produce the symptoms due to tumors of this location. Gummata of the brain are common among children with congenital syphilis, and they cannot be distinguished from brain tumors due to other conditions by their symptoms. When evidences of brain tumor occur in children known to have a syphilitic ancestry, or when such symptoms are associated with other evidence of syphilis, it may be supposed that the tumor is really a gumma. Surgical procedures are contraindicated for gumma of the brain.

**Juvenile paresis** and juvenile tabes are rare. The symptoms and diagnosis are those of the adult forms of the disease. Juvenile paresis is characterized by progressive loss of memory and of intelligence. The child drops a syllable or a word, when he is talking, loses his power of co-ordination for fine movements, loses his power to write, walk or perform any delicate action. He becomes unclean in his habits and becomes bedridden and completely demented within a year or a few years. The pupils do not react to light and optic nerve atrophy is apt to occur if he lives a few years. The spinal fluid shows many cells, increase of globulin and a strongly positive Wassermann. The symptoms begin in a child who has from his first year until he is six years old or more, been apparently normal in every way, but who has displayed symptoms of syphilis during the first few months of his life. He may live several years, and finally dies from bed-sores, inanition or some intercurrent disease.

**Cerebral syphilis** is characterized by a continuous series of symptoms. Some mental defect has been present from the first year of life. Speech has been delayed and usually remains imperfect. Attacks of headache, vomiting, screaming and vertigo appear during life, at intervals. The pupils are often irregular and vision is somewhat subnormal. Hemiplegic attacks occur, and may persist for some days or weeks. The sides may be involved in turn, but not both at the same time. Epileptic attacks may occur. The mental deterioration is not marked. The child does not develop properly, but he continues to learn some things, and he does not lose all that he has gained. Dementia is not complete, but this form of neurosyphilis may be superseded by paresis. The spinal fluid shows strongly positive Wassermann, increased globulin and cell count, and gives positive colloidal gold reaction. The child may live for

twenty years or more, never able to perform any useful duties. He dies from some intercurrent disease, usually pneumonia or tuberculosis.

### Treatment

I. Prophylaxis. Every effort should be made by every physician and every one who has the good of the human race at heart to prevent adult persons from contracting the disease, and to prevent procreation by persons infected. Marriage should be avoided, and married syphilitics should not have children.

II. Active treatment should be begun as soon as the baby shows evidence of the disease. If medical treatment seems desirable for any reason, some doctor who is skilled in the use of the arsenic, iodine and mercurial preparations should be consulted. Several osteopathic physicians report excellent results, with no evil after effects, with the following non-medical treatment:

Every possible precaution against the infection of those who take care of the child must be employed. The mother may nurse her baby whether she has had syphilitic symptoms or not. If she cannot nurse the baby, the artificial food must be planned with great care. (A wet nurse who has had recognizable syphilis or who has borne a syphilitic child is very rarely to be found. A wet nurse who has not had syphilis is in great danger if she nurses a syphilitic child).

The skin lesions should be dressed with ammoniated mercurial ointment and the care indicated for the treatment of babies with impetigo contagiosa given.

Contracted muscles and interosseous lesions must be kept carefully corrected. Examinations should be made daily and every indicated change made in the treatment or the care of the child.

**Prognosis.** Syphilitic pregnancies usually terminate in early or late abortion or premature births. The fetus often dies before or during birth. If a living syphilitic child is born, it usually dies during the first month. If such a child lives beyond the first year, there may be recurrence of the symptoms or the development of later symptoms during the first year of school life or during the puberty changes. Syphilitic children who live are subject to extremely severe attacks of the acute infectious diseases, and these are often fatal.

Mental deficiency is extremely common among these children. They are two or three years behind normal children of the same age, in school, and are rarely able to reach high school. Occasionally these children seem to be of normal mentality. In many cases they are moral imbeciles.

The syphilitic child may seem perfectly healthy at birth, and no symptoms may appear which arouse the suspicion of the mother or

nurse that he is not as well as babies usually are, or that the symptoms from which he suffers are not due to minor errors of diet and care. In other cases the child may seem to be completely recovered from the syphilitic symptoms noted at birth. Then, after the child is six years old, juvenile tabes or juvenile paresis may appear, or, very rarely, other symptoms of syphilis may appear, and any of these conditions be fatal.

### ACQUIRED SYPHILIS IN CHILDREN

This is a rare condition. It is due to kissing by a syphilitic person, nursing from the syphilitic breast of a wet nurse, or contact with clothing, nipples, nursing bottle, drinking cups or other articles which had been handled or used by a syphilitic person. The common use of toilet articles and especially the common use of a syringe when there is a syphilitic person in the family is dangerous.

The primary sore and the later symptoms do not vary greatly from extragenital syphilitic manifestations found during adult life. In children the symptoms are usually milder than in adults who have contracted syphilis with an extragenital chancre, and the effects are much less severe than in hereditary syphilis. The cutaneous eruption is usually widespread, but is more often macular than papular. Children tend to develop moist condylomata more frequently than do adults.



## PART XIII. DISEASES OF THE SENSE ORGANS

### CHAPTER XCII

#### Introduction

The importance of the organs of sensation in the development of adult mentality and in the determination of the motor activities throughout life has long been neglected. In the last analysis, all motor reactions are due to sensory impulses which affect the nerve centers at some time during life.

The newly born baby has no consciousness. Sensory stimuli govern the motor reactions through reflexes co-ordinated in the spinal cord, the pons, bulb, basal ganglia and midbrain. The touch of the nipple initiates sucking movements immediately after birth. The eyes follow a bright light a few days later. Pain causes a cry during the first day of life, and other motor reactions to sensory stimulation may be noted within the first few days of life. These reactions are very complicated and they imitate closely the motor reactions associated with consciousness in later months and years of life. It must not be concluded that the baby has the same consciousness of which people are aware after the cerebral tracts have become medullated.

With the development of the cerebral tracts and the cerebral centers the child experiences a gradually awakening consciousness. It is not possible to say at what time of life the child becomes definitely self-conscious, since motor reactions are no criterion. No experiment has been devised which indicates the existence of consciousness, other than the study of the motor reactions, and these can be the result of the activity of subconscious nerve centers.

By the development of the cerebral neurons and the medullation of the tracts which associate the various parts of the central nervous system consciousness becomes possible.

Personality, character, emotional qualities and mental ability are dependent entirely upon the structure of the brain at birth, as it is acted upon by sensory impulses during infancy and childhood. The great importance of sensory impulses during the early years of life cannot be over-estimated. All educational methods are based upon sensory impulses of one kind or another. It is evident that the child's behavior is an adequate reaction to his surroundings only when his sensations are normally definite. When, for any reason, his sensations are not the normal effects of his environmental conditions, the motor reactions cannot be the normal response to those conditions. If this condition is frequently repeated the child's education becomes seriously affected. Normal mentality is possible only when the sensory impulses and the sensations perceived in consciousness are adequately answered by motor reactions.

The common sensations are rarely affected during childhood. Syringomyelia causes disturbances in the sensations of heat, cold and pain, some disturbance of the sense of touch and, rarely, a disturbance in the sense of muscular effort.

The sensations of smell and taste are not often affected. Hysterical children complain of peculiar odors. Taste and smell are both disturbed by fevers, especially the acute infectious febrile diseases of childhood. Diseases of the nasal membranes disturb the sense of smell, and, since many of the sensations ordinarily considered as tastes are really odors, the child who has deficient sense of smell loses also an important part of what is usually considered taste sensation.

Children are very suggestible, and their ideas of what is pleasant or unpleasant in smell or taste is very often due to some associations with odors or flavors. This fact must be considered in making a diagnosis of taste or smell disorders, and also in trying to make a diet list acceptable to the sick child.

## CHAPTER XCIII

### DISEASES OF THE EAR

#### Foreign Bodies in the Ear

Many foreign bodies may be found in the external auditory canal. Children put small objects into the ears, experimentally or as a means of impressing other children. Beans, pebbles, pieces of toys and any one of a great number of small articles are so placed into the ear by children. Some of these swell, and thus become very difficult of removal. Others set up an inflammatory reaction and become imbedded in the swollen membrane. Any of the articles named may reach the external auditory canal accidentally. Insects may enter the canal, and they cause trouble by their presence, or they may lay eggs which later develop larvae. Moulds of several kinds have been found growing in the canal.

Symptoms due to the presence of foreign bodies vary greatly. If the object is not deeply placed there may be some sense of tickling or discomfort. If the canal is occluded there may be deafness in the affected ear. If the object is deeply placed, or if it has been pushed deeper in attempts at its removal, there is usually severe pain. There may be serious inflammation; the tympanum may be injured and middle ear disease follow. The invasion of the mastoid cells occasionally occurs.

The meatus should be examined carefully, using a bright light, with or without the head mirror. The ear speculum should be carefully inserted. If the canal is only partially occluded, a stream of sterile warm water should be allowed to flow into the ear, directed forward and downward. The auricle should be pulled upward and backward while the water is flowing. This usually floats the article out and no harm results. If the canal is completely occluded or if the article is too large to be floated out in this way it may sometimes be removed by a dull hook, curette or forceps. This should be successful a radical operation may be necessary. This should be performed by some one especially skilled in that work.

#### THE CARE OF DEAF CHILDREN

Complete deafness is extremely rare, but partial deafness is common. Deafness may be due to any one of a long list of diseases, may be due to accidents or may be hereditary. An inherited structural condition may permit deafness to result from comparatively slight injury, so that there is really a hereditary factor in deafness due to disease or to accidents.

Lesions of the axis and the third cervical vertebrae are almost invariably present in children whose deafness is due to an acute in-

fectious disease. Other lesions of cervical and upper thoracic vertebrae are frequently found also. During the course of any infectious or febrile disease such lesions are often spontaneously produced, with increased tendency to the development of otitis and deafness. If the child is watched and such lesions corrected as they appear, the danger of otitis is avoided. Deafness is not a sequel of the acute infections under osteopathic care.

Hereditary deafness or hereditary tendencies to deafness are perpetuated on account of the gregariousness of those who suffer from any form of disability and the resulting marriages among those who are deaf. This tendency is greater among the deaf than it is among the blind, but it is not so great among the deaf as it is among those suffering from slight mental defects.

Deafness can often be prevented in children by careful treatment of the acute infectious diseases, especially scarlet fever, influenza and rheumatism. Adenoids and infected tonsils are also common causes of deafness, and these are easily removed.

The hearing of children should be watched, and at the first indication of diminished powers the condition should be investigated. The external auditory canal very often shows the cause of the deafness; accumulations of ear wax, inflammatory conditions or a foreign body. These factors are easily removed. If there is any permanent cause of deafness, the child must be taught lip-reading at once. Special methods of education are indicated for children who are very deaf, while those whose hearing is only slightly subnormal require only to be taught lip-reading, when ordinary schools become as good for them as for children with normal hearing.

## OTITIS

### (Otitis Media)

This is a very common disease during infancy and childhood. Catarrhal otitis media resembles the catarrhal inflammations of other mucous membranes, and it may be followed by suppuration. Suppurative otitis media may be suppurative from the beginning, or may follow the catarrhal form. The inflammation may extend from the throat by way of the Eustachian tube, which is relatively short and of greater diameter during childhood, or it may be a result of perforation of the tympanic membrane and infection from the external ear.

Lesions of the upper cervical vertebrae, especially the axis, are important predisposing factors in otitis media and otitis interna. Lesions of the fourth cervical and the upper thoracic vertebrae seem of greater importance in otitis externa.

Several infectious diseases may be associated with otitis media; the most common are pneumonia, scarlet fever, measles, diphtheria, influenza and pertussis. Typhoid fever, small-pox and cerebrospinal



meningitis are also often associated with otitis media. Marantic babies with bronchopneumonia, tuberculosis, syphilis or any gastrointestinal disease nearly always show also some otitis media. Any of these forms of otitis media may be either catarrhal or purulent.

Purulent inflammation is due to infection with some of the pyogenic organisms. Streptococcus causes the most severe inflammation, but the pneumococcus, staphylococcus and a few others are also important factors. Tubercle bacilli, influenza bacilli and occasionally the typhoid bacilli are often associated with the frankly pyogenic germs. The pneumococcus is by far the most frequent cause, in babies.

Tissue changes include swelling of the membrane of the tympanic cavity, closure of the Eustachian tubes and the development of a serous or mucous exudate, in the catarrhal form. Purulent otitis media is associated with increased fluid formation, and the presence of many leukocytes and pus cells. Blood is nearly always present in the pus. The inflammation may extend to the neighboring bony tissue and thence into the meninges. The ear drum is often broken and the discharge emerges from the external auditory canal.

When a catarrhal inflammation continues and becomes chronic, adhesions occur which prevent normal mobility of the ossicles.

**Symptoms** do not distinguish between the catarrhal and the purulent types of inflammation, unless the ear drum is broken and the pus emerges from the external ear. One or both ears may be affected, either simultaneously or in turn. Bilateral cases are usually catarrhal and are associated with some acute infectious disease. In such cases there may be no recognizable symptoms of otitis media on account of the severity of the symptoms of the primary disease.

Typical symptoms occur with a rather abrupt onset. Fever may be slight or may reach 104° F. or more, and the temperature usually fluctuates considerably. Infants often put a hand over the affected ear, while children who are able to talk complain of the pain. The pain may be fairly constant, though worse at night, or there may be a fair degree of comfort during the day with severe pain at night, or there may be paroxysms of pain at intervals. There may not be any localizing symptoms, and the child may seem very ill with fever and discomfort. Impairment of hearing is present, but often escapes notice.

Examination of the ear drum shows it to be bulging, and in purulent forms a yellowish appearance is noted. The blood shows marked leukocytosis in purulent forms, and usually shows some leukocytosis in catarrhal otitis.

In many cases the ear is not examined, and there may be pus found as the first symptom. In some cases there are vomiting, irregular pulse, convulsions, stupor and other symptoms suggesting meningitis.

Probably most cases of otitis media terminate by absorption, with no injury to the ear drum. No doubt many of the fevers of childhood for which no cause is known are really mild cases of otitis media.

Suppurative cases show more severe and erratic fever, generally, and the pain is usually more severe. The lymph nodes of the neck are usually enlarged and the cervical muscles are rigid. When the membrane is perforated and the pus drained away, the fever, pain and deafness may disappear immediately or within a few hours. This condition is usually unilateral.

In occasional cases the draining does not give much relief, and more serious conditions result. In still other cases, in which perforation may or may not occur, the condition persists as a chronic purulent otitis media.

### Complications

Complications are serious, and they occur so often that they should be kept in mind whenever otitis media occurs. The complications are much more apt to occur if the child has lesions of the upper cervical or the upper thoracic vertebrae.

Mastoiditis is the most common complication. It is more apt to occur during infancy and early childhood because during early life the mastoid process contains a single cell, connected with the tympanic cavity by a fairly large opening. As the child grows older numerous divisions are formed and the connection with the tympanic cavity produces serious symptoms only rarely.

Symptoms are definite. Fever increases after an attack of otitis media has been present for a day or a few days, the mastoid process becomes swollen and very tender and there may be pain in that region. The swelling may cause the auricle to stand away from the head and the swelling may involve the neck and the submandibular region. Sometimes fever and pain are slight or absent.

Thrombosis of the lateral sinus is an uncommon sequel of mastoiditis and it may occur as a result after the mastoid operation. The symptoms of this thrombosis are indefinite. The superficial veins are dilated, and the jugular vein may become tender and cord-like from this dilatation. Headache is usually severe; convulsions or coma may follow this occurrence.

Meningitis may follow either mastoiditis or otitis media from the burrowing of the pus into the skull. It may follow cerebral abscess or septic thrombosis due to otitis media or mastoiditis. This is not a very common complication of otitis in infancy, and diagnosis is difficult. The course of the disease resembles that of pneumococcus meningitis.

Facial paralysis does not often occur during childhood. It is due to destruction of the facial nerve in its canal, on account of the inflammation of the petrous portion of the temporal bone.

### Treatment

Prophylaxis includes all measures for maintaining normal structural relations of the tissues associated with the ears. Vertebral lesions and lesions of the soft tissues of the neck must be corrected as they occur, adenoids and enlarged tonsils must receive proper attention, and the acute infectious diseases must be avoided as far as possible. During the progress of any infectious disease the throat and nose should be kept as clean as possible, by spraying, washing and gargling gently with warm water or warm normal salt solution which has been boiled. No forceful methods should be used, and the child should not gargle violently on account of the danger of driving infectious organisms into the Eustachian tubes.

The treatment of the attack is, at first, the relief of the pain. Hot applications are usually most comfortable. A hot water bottle or a bag of hot salt, an electric pad at highest heat or a hot poultice often give relief. These applications are usually tried before the doctor is summoned.

Lesions are invariably found after the attack, if they have not been present before (nearly always these lesions precede the attack). Lesions of the mandible, occiput and upper cervical and lower thoracic vertebrae should be corrected if they are present. Lesions of the first rib and the clavicle are frequently found after the attack has begun, but they are less often causative than are the upper cervical lesions.

Examination of the ear drum should be made at once. If there is decided bulging and the child has fever, paracentesis should be performed at once. If this is done immediately after the bulging and fever are pronounced, further inflammatory changes may be avoided. In the mild catarrhal cases discharge ceases almost at once and the wound heals within a few days. There is no deafness nor other evil after-effects attributable to paracentesis properly performed. If there is tenderness over the mastoid, and the child is feverish, paracentesis should be done at the first recognizable bulging. After paracentesis the ear should be syringed, very gently, two or three times each day, using a warm 1:10,000 bichloride of mercury, or a warm half-saturated boric acid solution or a 40% peroxid of hydrogen solution. All of these are sterile, slightly antiseptic and cleansing. If much pus drains away, the irrigations may be given at three hour intervals, but in ordinary cases irrigations two or three times each day give better results than more frequent washings. After the irrigations the ear should be dressed with sterile cotton or a gauze wick soaked in any antiseptic solution may be left for drainage.

Mastoiditis may be relieved by drainage through the ear, secured by paracentesis, or it may be necessary to operate upon the mastoid

cells and drain them. This operation should be left to an aural surgeon of experience and skill.

Chronic catarrhal and chronic purulent otitis media require persistent treatment. Correction of structural abnormalities is necessary, first of all. Bony lesions, adenoids, abnormal tonsils and chronic pharyngitis must be given the treatment best adapted to those conditions.

If an aural surgeon is required, the osteopathic treatments must be given also. Usually the best results are secured by giving the corrective treatments both before and after the surgical operations have been performed. If the lesions of the upper cervical region, and such other lesions as are found on examination, are carefully and completely corrected before aural surgery, the operation gives much better results, if, indeed, it is not rendered unnecessary. The irritation caused by the operation usually causes abnormally contracted muscles, local edema and very often a recurrence of the cervical lesions. The treatment for the correction of these lesions, given after the surgical wound has healed, hastens complete recovery, diminishes the amount of deafness or prevents the occurrence of any deafness, and provides the best possible opportunity for the complete recovery of the child.

### Otitis Interna

Inflammation of the labyrinth is rare during childhood. It may result from an extension of the inflammation of the middle ear, or it may follow some acute infectious disease, especially scarlet fever, mumps or meningitis. The acute symptoms are rarely recognized, but include vertigo, nystagmus and persistent vomiting. Deafness is absolute when both ears are affected. Bone conduction is absent. Since the process is a destructive one, the prognosis is hopeless and there is no adequate treatment.

### Diffuse Otitis Externa

This inflammation of the external ear is common among children. Lesions of the upper cervical vertebrae predispose to infection. It may be due to aspergillus or other moulds growing in the external meatus; to pyogenic infection, especially after the external ear has been injured by a blow or other trauma; to the infectious agent which causes Vincent's angina, in children who are debilitated; or to the conditions which cause eczema. An insect bite or the presence of the insect may cause it. The condition may be either acute or chronic.

The symptoms include pain and itching of the ear and some swelling of the membranes of the canal. A moderate deafness is common and there is usually a discharge which may be thin or viscid, and which often becomes purulent in chronic cases. Feverishness is occasionally present.



**Treatment** depends upon the cause. Any foreign object must be removed. Warm moist applications give relief to the pain and itching. Douching the canal with a hot boric acid solution, half-saturated, gives relief.

Corrections of the upper cervical lesions should be secured. Any muscles which have been contracted as the reflex result of the irritation should be relaxed. These methods facilitate recovery, after the exciting cause has been removed.

Constitutional treatment is required in many cases, as is indicated by the examination of the child.

With proper treatment recovery occurs within a few days. Without treatment, if the cause persists, internal otitis media and deafness may result.

### **Pseudomembranous Otitis Externa**

This may be due to infection by the bacteria which cause the formation of a false membrane, and these are most commonly those of diphtheria. Other symptoms of diphtheria are usually present, but in some rare cases the ear is the only part affected.

The symptoms include local and constitutional changes. The ear is swollen and the canal is filled with a pseudomembranous tissue. A thin, watery irritating discharge appears and this erodes the skin which it touches. This erosion is then the site of the false membrane. There is fever; cardiac symptoms may be severe, and the constitutional symptoms of rather severe diphtheria are present.

**Treatment.** The ear should be irrigated with warm antiseptic solutions, such as a weak carbolic acid, bichloride of mercury or hydrogen peroxide solution. No irrigations should be used if the ear drum is not perfect, but the external canal may be swabbed frequently with small bits of cotton wet with the solutions.

Bony and muscular lesions are to be corrected, using very gentle manipulations.

### **Furunculosis of the External Ear**

The presence of small boils or abscesses upon the auricle or within the external canal is fairly common. They are due to any of the pyogenic organisms, entering through a small lesion of the skin.

Lesions of the upper cervical vertebrae predispose to infection of the external ear.

When the pus can be located it should be drained. When the pus cannot be located warm applications give relief to the pain. Ichthyol ointment is mildly antiseptic and gives relief. The lesions found on examination must be corrected. The cervical muscles, contracted as the reflex result of the irritation, must be relaxed.

Recovery is to be expected immediately after the pus has been evacuated, and within a few hours after the condition is recognized in any case.

## CHAPTER XCIV

### DISEASES OF THE EYES

**Malformations** of the eyes are rather rare. Microphthalmia, or abnormal smallness of the eyes is the most common defect involving the entire eye. Anophthalmia, or complete absence of both eyes, is very rare. Cyclopegia, or synophthalmia, is due to failure of the prosencephalon to divide properly. A single eye is then placed in the center of the forehead, usually near the root of the nose. The deformity is associated with other gross defects of the brain and skull.

Cryptophthalmia is a deformity of the lids; they fail to divide properly, and the eyes are hidden. It may be present alone, or may be associated with other minor defects. Epicanthus is a fold of membrane (normal in lower vertebrates as the nictitating membrane), which crosses the inner canthus of the eye from the upper lid to the lower. Congenital ptosis is common, in mild degrees. Coloboma is an angular defect of the eyelid with its base on the free margin.

Ablepharia, absence of the eyelids, may be either complete or partial. Lagophthalmos is a lack of covering for the eyes, either because the eyelids are absent or are shrunk. Cryptophthalmos is present when the lids are absent and the skin covers the eyes completely; the eyes are rarely normally developed beneath the skin. Cleft eyelid (coloboma palpebrae) is a fissure, somewhat resembling that of a hare-lip with which it is usually associated. Symblepharon is an adhesion between the lid and the eyeball. Ankyloblepharon is adhesion of the edges of the upper and lower lids. Blepharophimosis is the adhesions of the angles of the lids, or the presence of a band of fibers which unite the lids in their central areas. Ectropion is eversion of the edges of the lids. Entropion is inversion of the edges of the lids, usually associated with distichiasis, or incurved eyelashes.

Other deformities of the lids are rare.

Heterochromia is a condition in which the irises are of different color. The lighter eye is more subject to cataract later in life.

Corectopia is an eccentric position of the pupil. It may be a malformation or may be due to fetal iritis. One or both eyes may be affected, and the same condition may be found in several members of a family.

Coloboma of the iris is a fissure. It most often affects both eyes, but the left is the one affected most frequently when the condition is unilateral. Complete coloboma extends to the edge of the iris; incomplete coloboma merely notches the ciliary margin. Bridge

coloboma is characterized by fibers which cross the fissure. Coloboma of the iris is usually associated with other malformations, defect of the choroid, microphthalmos, congenital cataract, and fissures of eyelids, lips or palate. Coloboma of the lens is often associated with coloboma of the iris.

Iridemia is the partial or complete absence of the iris. Other malformations of the eye are usually present.

Polycoria, or the presence of two or more pupils in one eye, is a rare deformity. The abnormal pupil or pupils may be near the normal pupil or elsewhere in the iris.

Congenital cataract occasionally occurs. In the complete form the lens usually is white or bluish, densely opaque, and soft. There may or may not be other defects or deformities of the eye. The incomplete form occurs in several different forms, lamellar, zonular, central, pyramidal, punctate or fusiform.

Megalophthalmos (keratoglobus; megalocornea; buphthalmos; congenital glaucoma). This is probably a congenital form of glaucoma. The eye increases in all diameters and the intra-ocular tension is high. It is more often found in negro babies, and may be due to syphilis. The cornea is flattened, the iris becomes atrophic, the sclera thin and pale and the cornea may become cloudy. The treatment is surgical, and the prognosis is very gloomy.

Congenital opacity of the cornea may be an extension of the scleral opacity into the cornea, or there may be milky spots scattered over the cornea. Arcus juvenalis (embryotoxon) is a sclerosis of the edge of the cornea which resembles the arcus senilis.

Congenital pigmentation of the sclera may be general or spotty. They are most often found in the upper portion and are frequently associated with pigment peculiarities of the iris and the choroid.

Blue scleras are somewhat leaden in tint. The condition is due to hereditary syphilis, and may be present for several generations. The bones are especially prone to fracture upon slight trauma in children with blue scleras.

Choroideremia is congenital absence of the choroid, except for a small area near the macula. The subject of this deformity are night-blind, but have normal vision otherwise.

Albinism may be either complete or partial. There is no pigment in the iris or the choroid. The defect is associated with amblyopia, photophobia and refractive defects. The eye appears pink, from the reflection of the color from the blood vessels. The hair and skin usually lack pigment also. Several individuals in the same family may be affected. Albinism is a recessive trait and follows Mendel's law.



## EYE STRAIN IN CHILDREN

Children who seem nervous, or who do not advance in school as they should, or who seem disobedient, irritable and naughty may suffer from eye strain and this may be responsible for the entire condition.

Myopia may prevent a child from seeing clearly what is written upon the black-board at school and he may be unable to see gestures made upon the play-ground. He is, in most cases, unaware that his vision is at fault, and only the fact that he does not behave properly is evident to his associates, parents and teachers.

Hyperopia and astigmatism are responsible for marked nervousness. The child is subject to a constant strain and it becomes difficult for him to exercise proper self-control.

The change in the behavior of these children which follows the wearing of properly fitted glasses is most gratifying.

Lesions of the second thoracic vertebrae, or the third or the first, interfere with the control of the sphincter of the iris and the non-striated muscle fibers of the capsule of Tenon. Both these disturbances interfere with normal focusing, and they may cause distinct variations in vision.

When children suffer from eye-strain it is best to have the vertebral lesions corrected before glasses are fitted. If the lesions recur after correction it is probable that reflex muscular contractions are being produced. It is, in that case, best to have glasses fitted with the understanding that a new fitting may be required soon. The fitting of the provisional glasses then permits the correction of the lesions. New glasses may not be required after this, but in many cases glasses fitted before the lesions are corrected do not fit after the structural changes have been made.

## INFLAMMATIONS OF THE EYE

Children suffer from several inflammations of the eyes and the surrounding tissues. Ophthalmia neonatorum and amebic conjunctivitis have been discussed elsewhere.

### Blepharitis

Inflammation of the eyelids is common among children who are poorly nourished, or who suffer from the exudative diathesis.

**Etiology.** Pediculosis of the eyelids, eyestrain from any cause, seborrhea, eczema and infectious diseases, such as measles, small-pox and chicken-pox are the more common causes of blepharitis.

The eyelids become swollen and red, and the margins of the lids become scaly. Small ulcers may appear along the edge of the lids, and these may discharge a thin purulent secretion which mats the cilia together and may prevent the eyes from opening. The eye

lashes may be permanently destroyed. Conjunctivitis is a common complication. The condition is usually chronic and persistent, until the cause of the condition is removed.

**Treatment** includes the correction of the cervical and upper thoracic lesions always present in these cases. The most common lesions are those of the third to the fifth thoracic vertebrae. The general health must be improved in most cases; this follows the correction of such lesions as may be found in the spinal column or ribs, and the administration of a diet normal for the age and general condition of the child.

The eyes should be tested for errors of refraction and suitable glasses worn, if they are needed. Glasses should not be fitted until some change has been made in the spinal lesions, or else it may be necessary to have them changed within a few months.

At night the eyelids should be anointed with sterile vaseline, in order to prevent adhesions during the hours of sleep.

Antiseptic washes are indicated; 20% argyrol solution in water; half-saturated boric acid solution; or a solution of borax, 4 parts to rose water, 300 parts; are useful in different cases. If any one is annoying to the child, another may be substituted.

Pustules may appear, and these should be opened with a sterile needle and washed with the solutions employed for the lids.

Eczema, seborrhea and constitutional diseases which may be present must receive appropriate treatment for those conditions.

### **Hordeolum**

(Stye)

This is a localized purulent inflammation of the edge of the eyelid, originating in the sebaceous gland, hair follicle or connective tissue of the lid. It may be associated with blepharitis, or may occur without any general inflammation of the lids. Some children develop styes frequently.

The infectious agent is usually a staphylococcus. There is first a slight redness and swelling, then the appearance of a small yellow spot at the edge of the lid. The entire process is very painful.

Hot applications are useful in relieving the pain. The yellow spot should be opened with a sterile needle and the pus gently evacuated. In many cases this cannot be done, on account of the small size and lack of definite pointing. The condition disappears completely within a day or two, and no harm results unless the styes appear very frequently, in which case blepharitis is present, and the cilia may be destroyed about the affected areas.

### **CONJUNCTIVITIS**

Inflammations of the conjunctiva may be due to any one or more of several etiological agents.

Lesions of the second thoracic and the first and second cervical vertebrae interfere with the normal vaso-motor control of the orbital blood vessels, and thus predispose to conjunctivitis. Eyestrain and exposure to improper lighting are also predisposing agents.

Exposure to wind or dust, foreign bodies in the eye, misplaced eyelashes and exposure to irritating fumes are mechanical irritants which cause conjunctivitis. Bacteria which cause inflammation of the conjunctivae are numerous. Any of the germs which cause inflammation of mucous membranes anywhere may cause conjunctivitis. The infectious agents of nasal catarrh, the acute infectious diseases or the pyogenic organisms are occasionally responsible for conjunctivitis. The eye is exposed to many infectious agents and it is evident that the presence of these cannot be the sole cause of non-epidemic conjunctivitis. Several types are recognized.

### **Catarrhal Conjunctivitis**

This is the simple form. It may result from any mechanical irritation, and no infectious agent is present. Both eyes are commonly affected, unless the disorder is due to some foreign object in one eye only.

The symptoms include itching, pain and discomfort of the affected eye or eyes. Photophobia is usually rather severe. The eyes are congested and the lids may be somewhat edematous. Vision is usually somewhat hazy. The secretion may be free or scanty. Seropurulent secretions are commonly due to the presence of a staphylococcus.

### **Purulent Conjunctivitis**

This may follow the catarrhal form and is then due to infection of the membranes already somewhat inflamed, by one of the pyogenic organisms. The pneumococcus and the gonococcus may reach the normal eye and set up inflammation. Gonorrheal conjunctivitis has been discussed with the other diseases most commonly found in the newly born.

### **Vernal Conjunctivitis**

This disorder is fairly common in children who live in houses with poor ventilation and excessive heat. With the beginning of warm weather each spring the eyes become inflamed. Photophobia, lacrimation, excessive mucous secretion of the lids, and the development of small, greyish, flat nodules upon the eyelids, both on the palpebral and ocular surfaces of the conjunctivae. These are not found upon the cornea.

### **Pseudomembranous Conjunctivitis**

This form is due to diphtheritic or other infectious agents. When the infectious agent is not the Klebs-Löffler bacillus nor the streptococcus, the condition is not extremely severe. There is severe

conjunctivitis with a thin, seropurulent discharge and a deposit of false membrane upon the inner surface of the lids. The disease may persist for two to four weeks, but recovery is complete.

*Streptococcus conjunctivitis* is characterized by more severe symptoms. The false membrane is formed upon the eyeball and the cornea may be destroyed. The secretion is more purulent and thicker in consistency; the streptococcus may be found in the discharge. This form of conjunctivitis may cause blindness or may even be fatal.

Diphtheritic conjunctivitis is usually associated with diphtheria elsewhere, but may exist without other diphtheritic symptoms. The false membrane is formed over the eyeball as well as the inner surfaces of the lids, and there is often ulceration of the cornea. The constitutional symptoms are those of diphtheria and the disease is contagious.

### **Acute Contagious Conjunctivitis**

(Pink Eye)

This disease is due to the general predisposing causes of conjunctivitis, plus infection with the Koch-Weeks bacillus. The symptoms begin about 36 hours after exposure and include the symptoms of severe catarrhal conjunctivitis, with a mucopurulent secretion and sometimes chemosis. Burning and pain are severe, and the lids adhere quickly when the eyes are kept closed.

### **Angular Conjunctivitis**

This is a subacute or chronic conjunctivitis, due to the predisposing causes of conjunctivitis plus infection with the diplobacillus of Morax-Axenfeld. Aching and a sense of irritation, such as might be produced by dust in the eyes, with the other symptoms of conjunctivitis, are the symptoms. The congestion is most marked at the canthi. The secretion is greyish and scanty, not purulent, and it is adherent to the lids or accumulates at the inner canthus. The lids are fastened together during the night. Sometimes blepharitis is more pronounced than conjunctivitis, sometimes the opposite relation is present. Corneal ulcers and phlyctenules are frequent complications. The disease is slightly contagious.

### **Follicular Conjunctivitis**

(Follicular Ophthalmia; Folliculosis; School Follicles)

This condition is characterized by the presence of small follicles, composed of lymphoid tissue, in the conjunctiva. They are most common in the retrotarsal folds, are usually arranged in parallel rows and are whitish or pinkish white in color. They may be present without any inflammatory reaction on the conjunctivae, and the condition is then called "folliculosis". When the conjunctivae are



inflamed the condition is properly termed "follicular conjunctivitis."

The exact cause is not known. The disease occurs most frequently in children who are crowded in "homes" in unhygienic conditions. School children who are anemic or debilitated, or who suffer from adenoids and follicular pharyngitis, or from refractive errors are especially subject to the disease.

Symptoms are vague. The children complain of photophobia and they are reluctant to perform any close work. The eyes may not show any abnormal appearance unless the lids are examined carefully.

The condition resembles an early stage of trachoma, but the follicles are smaller and paler and are not found upon the bulbar conjunctivae in follicular conjunctivitis.

### Treatment of Conjunctivitis

Corection of the lesions as found is important in securing the most rapid recovery. These are always found in the upper cervical region. If lesions were not present at the onset, a condition which is not common, there are reflex muscular contractions which are often responsible for later lesions. The reflex contractions and the edema of the tissues are harmful and should be relieved as soon as practicable.

The diet and hygiene should be governed by the condition as found. Diet of fruit juices, vegetable soups and some milk is best for children. Babies rarely suffer from the disease; if they do the conditions are apt to be extremely severe.

Local applications may relieve the pain. Small pads made of linen or soft cotton may be soaked in hot or cold water, and laid over the closed eyes, or the pads may be soaked in some lotion. The eyes must be protected by dark glasses, if the condition is mild, but if the inflammation is severe the child must be kept in a dark room.

Douching the eyes with any aseptic or antiseptic solution removes the infectious agent and the pus, and gives the cleanliness necessary for recovery. An eyecup should be used for the douching, if the condition is not very severe. Boric acid, 1:100, or warm normal salt solution is useful for this douching. A few drops of a 25% solution of argyrol is useful when the infectious agent is the streptococcus. The edges of the lids should be smeared with vaseline in order to prevent the lids from sticking together.

Contagious conjunctivitis must receive the argyrol solution or a 5% solution of silver nitrate. Angular conjunctivitis is best treated with zinc sulphate solution, 1:250.

When the condition is at all severe the child must be put to bed. Continuous irrigations are then indicated, in many cases. The child must lie with the head turned to one side, upon a rubber cloth, with the eye to be treated downward. A container with the solution to be used should stand about a foot higher than the eye to be treated. A small glass tube at the end of a rubber tube should carry the solution from the container to the eye, and the entire apparatus must be sterile as well as the solution. The stream of water must be directed into the eye at the upper canthus, should flow over the eye to the lower canthus and then into a vessel placed to receive it. This continuous irrigation should be maintained for ten minutes to half an hour, then the eye should be covered with a hot or cold pad, as is most comfortable, for ten minutes or more. If both eyes are affected the child should turn the head, so that the infectious agent shall never be carried to the nasal passage or the other eye at any time.

Vernal conjunctivitis requires the treatment for mild conjunctivitis at the time of the attack. For the prevention of later attacks the general constitution of the child must be built up by securing wholesome living conditions, correction of the invariable lesions of the upper thoracic and upper cervical vertebrae, and by fitting glasses, if these are indicated.

For all forms of conjunctivitis, the correction of lesions as found is necessary for the most speedy and complete recovery.

### TRACHOMA

(Trachomatous Conjunctivitis; Granular Lids or Conjunctivitis; Egyptian Ophthalmia)

This is an infectious and contagious disease of the eyes, characterized by inflammation of the conjunctivae and the development of adenoid follicles.

**Etiology.** The disease is due to some infectious agent which has not yet been definitely isolated. Certain very small bodies, resembling extremely small diplobacilli, have been described in the cells of the secretion. These are surrounded by a clear zone, and have been called "chlamydozoa" for that reason. These are more easily found in the early stages of the disease.

### Types of Trachoma

Papillary trachoma (chronic trachoma). The trachoma granulations are small and are concealed by the greatly enlarged conjunctival pseudopapillae.

Follicular trachoma is characterized by the great size of the trachomatous granulations. These are composed of lymphoid tissue, are associated with lymphoid layer of the eyelid, and may be partially encapsulated.

Non-inflammatory follicular trachoma is characterized by the presence of hypertrophied lymphoid follicles which somewhat resemble adenoid tissues of the naso-pharynx. This is probably not infectious and not a true trachoma.

Mixed trachoma (diffused or complicated trachoma) is characterized by enlarged papillae and large granulations which are not hidden by the papillae.

Sclerosing trachoma shows hard, leathery flattened tumors in the upper tarsal and the retrotarsal conjunctivae.

Acute trachoma is probably due to the trachomal infections of a pre-existing catarrhal conjunctivitis. Acute exacerbations of the ordinary form of trachoma may occur at any time, and this condition is extremely painful and dangerous to later vision.

In all of these various conditions the processes of the inflammation are the same, and they differ only in the relative preponderance of the various pathological factors.

**Symptoms.** The onset is insidious. The granulations appear as small whitish or grayish translucent bodies, arranged in rows, and somewhat resembling fresh eggs of the frog's spawn. These bodies are most abundant on the palpebral conjunctive and the upper retrotarsal folds. Unless this area is exposed completely in making the examination they may not be found. They are sometimes found on the bulbar conjunctivae and in the semilunar folds. The discharge may be fairly profuse or very scanty. The lids are rarely adhered by the discharge. These processes may persist for weeks or months, with slowly increasing pressure due to the increasing granulations.

After some weeks or months, the blood vessels dilate more widely, a purulent or mucopurulent discharge appears in increasing amounts, the cornea may be involved, and pain, photophobia and irritation are very serious. The follicles undergo fatty degeneration and there may be ulcers, and a gelatinous appearance is due to hyaline degeneration of the superficial layers. This may persist, or it may be finally absorbed, and scar tissue is left over the site of invasion. Xerosis is a marked hardening of the scar-like conjunctival tissue.

### Sequelae

Pannus is a vascular, gelatinous, translucent tissue which forms over the cornea, most commonly the upper area. It may be thin or very thick and fleshy. Ulceration of the cornea may occur with this formation of this tissue. Iritis may follow perforation of the cornea by these ulcers.

Trichiasis, distichiasis, entropion, atrophy and shrinking of the conjunctivae and cloudiness of the cornea are frequent sequelae.

Blindness is a common result of these pathological conditions.

### Treatment

This disease requires the services of an expert oculist, if it is possible to secure one. If it is not possible to secure the services of a good oculist, the treatment must be given as follows:

The child must be isolated and the discharge from the eye received on cloth or cotton and burned as soon as possible. Such corrective and constitutional treatment as is indicated on examination must be given.

Irrigations should be given, using the method described for contagious conjunctivitis. Saturated solution of boric acid, bichloride of mercury, 1:10,000, or a 1% solution of sulphate of zinc may be used for irrigation, warm normal salt solution may be used; the solutions named have been used, if there is painful inflammation of the conjunctivae. Potassium permanganate, 1:5000, may be used for irrigations when the granulations have become degenerated.

Many other methods are employed, such as freezing with carbon dioxid snow, cauterization, X-ray and radium treatments, and other less common procedure, but these require the services of an expert oculist.

### PHLYCTENULAR CONJUNCTIVITIS AND KERATITIS

(Tubercular or Eczematous Conjunctivitis)

This disease is due to malnutrition and certain chronic and constitutional diseases. The exudative diathesis, eczema, tuberculosis, rheumatism, chronic or repeated digestive disturbances, chronic or repeated rhinitis and the malnutrition due to unhygienic conditions are all occasionally found in children suffering from phlyctenules. After measles and other infectious diseases this inflammation may occur.

The phlyctenules are small, grey translucent tumors, formed of small round hyaline cells with some localized edema and congestion. The blood vessels around the phlyctenule are visible. The apex becomes soft and yellowish, breaks down and an ulcer is formed. Phlyctenules are most frequent near the tarsal edge or near the corneal edge, in phlyctenular conjunctivitis, and are on the cornea itself in phlyctenular keratitis.

The ulcers leave no scar on the conjunctivae, but they may leave a scar and thickening upon the cornea which interferes with vision. The ulcers may perforate the cornea and cause blindness in the affected eye.

The onset is insidious but the symptoms become very serious. Lacrimation and pain are severe and photophobia becomes so marked that the child is unable to open the eye at all. In tuberculous children the inflammation is very resistant and prolonged.



**Treatment.** Mild cases may be treated with lotions, as in other forms of conjunctivitis. The eyes should be protected from irritation and excess of light.

The constitutional conditions must receive such treatment as is indicated on examination. Lesions of the upper cervical and upper thoracic region must be corrected. Change of climate often gives marked improvement.

When the cornea is involved, an ophthalmic surgeon should be consulted.

**Prognosis** must always be guarded. When the conjunctivae alone is involved no visual disturbance is to be expected. Many of the corneal ulcers clear up completely, and vision remains normal. But it is not possible to determine in any case whether there may be a scar or perforation of the cornea resulting from corneal ulcers.

### XEROPHTHALMIA

(Eye Disease; Keratitis; Keratomalacia; Keratoconjunctivitis; Ophthalmia; Conjunctivitis)

This disease is rare in America, but has been rather prevalent in Europe, especially during the last year of the war and the succeeding years.

**Etiology.** The disease is due to a lack of vitamin A in the diet. Experimentally, animals placed upon a diet free from vitamin A undergo characteristic changes.

**Diagnosis.** The characteristic eye symptoms plus a study of the diet makes the diagnosis clear.

Lacrimation and photophobia are usually the first symptoms noted. Edema of the eyelids and increasing viscosity of the secretions follow. The secretion becomes bloody, and dries around the eyes, often causes the edematous lids to become adherent. The secretion may accumulate beneath the lids. Corneal ulcers follow, and blindness results from the injury.

The general health of the child suffers also from the lack of vitamin A. Weakness, emaciation, abnormal development of the bones, imperfect calcification of the teeth, and various other indications of malnutrition occur. Death may result from inanition before the xerophthalmia becomes very well developed. The hunger-osteomalacia of Austria is of this type.

**Treatment.** To the child's diet raw green vegetables or their raw juices should be added, at first in small amounts but within a few days increasing to that given normal children. Butter and fresh milk are rich in vitamin A. Cod liver oil contains a very great amount of vitamin A., but it may interfere with digestion. Tomatoes, spinach, milk, cream, butter and egg yolks are also rich in vitamin A.

Such lesions and tensions as may be found should be relieved and general treatment, especially of the mid- and lower thoracic spinal column aid in digestion and absorption of the life-giving foods.

**Prognosis.** Improvement follows the change in the diet within a very few days, in early cases. Even when the eyes seem seriously injured and emaciation severe, recovery may occur with remarkable celerity, when adequate amounts of the vitamin A. containing foods are administered.

After corneal ulcers have been developed, vision may not return; the amount of recovery in these cases depends upon the location and the size of the corneal ulcer.



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